

THE IRON AGE

New York, July 3, 1919

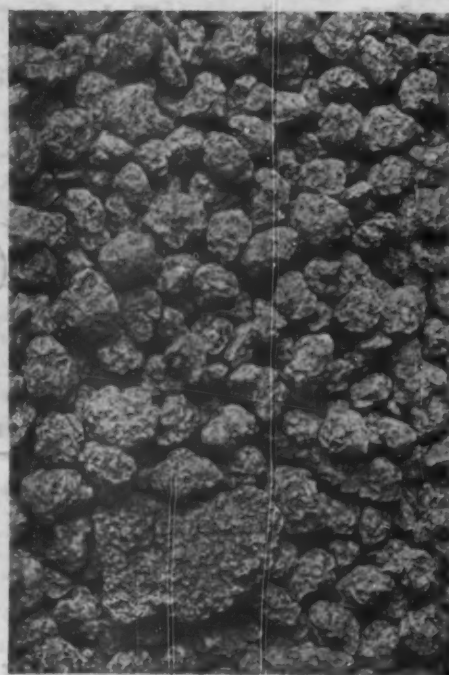
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New York, July 3, 1919

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Making Three Million Trench Mortar Shells



How a General Motors Automobile Plant Turned Over to Shell Assembly Exceeded Scheduled Production—A Remarkable System of Conveyors

—BY E. C. DE WOLFE, M.E.—

AMONG the interesting stories of munitions production which could not properly be published during the days of wartime activity, but may now be told, is that of the intensive work in assembling trench mortar shells at the Jackson-Church-Wilcox Co.'s plant No. 2, Saginaw, Mich. This company is a division of the General Motors Corporation, by which a contract was made with the Ordnance Department for the production of 3,000,000 shells, ready for loading, for use in the 3-in. Stokes trench mortar. The contract quantity was to be delivered within one year from Dec. 17, 1917.

The parts of the shells were produced in eight different plants of the corporation and shipped to the "Jacox" plant for assembling. This plant, formerly devoted to the manufacture of automobiles, was turned over wholly to the work of shell assembly. Parts began coming in February, 1918, the assembling being done almost entirely by hand methods, which nevertheless produced

strict manager for the Jackson-Church-Wilcox Co., assisted by D. O. Thomas, No. 2 factory manager, and Frank D. Chase, Inc., industrial engineers, Chicago, in collaboration with manufacturers by whom various items of machinery and special devices were supplied.

The result was an installation which, started in May, turned out 20,000 per day through June, averaged 25,000 through August, and was 140,000 ahead of schedule when the armistice was signed.

At full production there were 550 persons engaged in the work, about 70 per cent of whom were women and girls. Pressure was relieved on Nov. 11, and work proceeded in more leisurely fashion until the contract was fulfilled. The photographs here shown were made

when the operative force had been materially reduced.

The Stokes Mortar and Shell

The Stokes trench mortar, eliminating details, consists of a plain barrel of heavy tubing, with

Of interest in this article by Mr. De Wolfe, descriptive of the manner in which trench mortar shells were assembled at the rate of 25,000 per day, is the elaborate system of conveyors, belt, roller, gravity and slat, used in the transfer of parts from operation to operation, until delivery of the completed and boxed shells to freight cars. The author states that a visitor to the plant, seeing the operation of the system and the continuous movement of its many parts, likened it to a huge mechanical toy. The toy, however, was not a plaything, but a mechanism created by national necessity and devoted to a very grim purpose.



Fig. 1—Trench Mortar Shell Parts. Left to right: Booster jacket and head assembled, booster jacket, temporary plug, head casting, casting, base casting, cartridge container, and base and cartridge container assembled

shells at the rate of 5000 per day through March and at a still higher rate through April.

Equipment for Rapid Handling

Meantime the plans for mechanical equipment and intensive methods were schemed out, under the direction of George H. Hannum, Saginaw dis-

a head at whose center is fixed a firing pin which is struck by the cap on the shell when the latter is dropped into the mortar. A tripod, providing simple means of pointing within rather narrow ranges of swing and elevation, supports the mortar, so that the complete equipment is in two parts, each easily portable by one man. The mor-

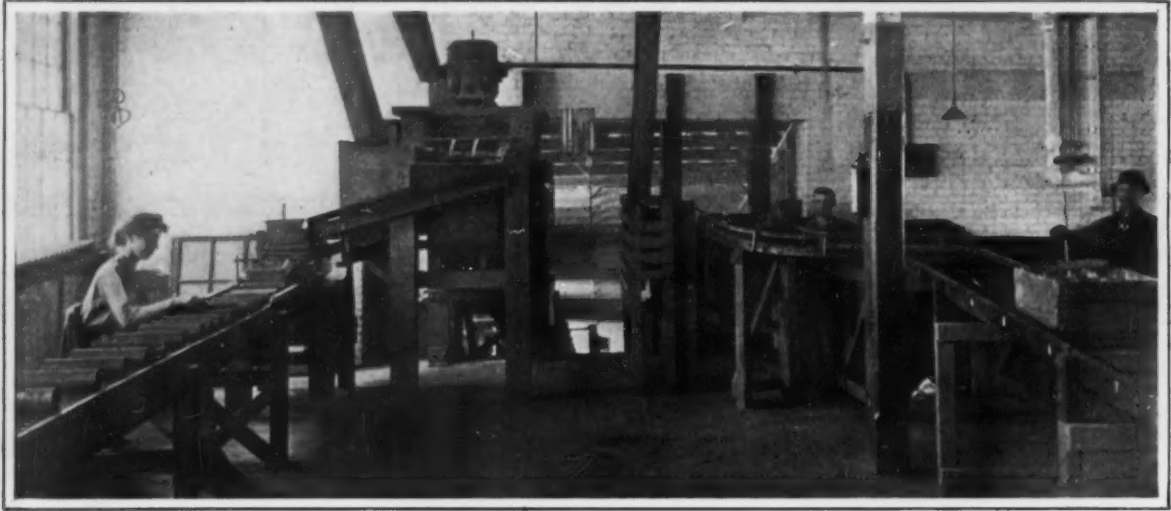


Fig. 2—Belt Conveyors Which Carry Cleaned Parts to Second Floor, Where Assembly Began. They have independent clutch control at the heads

tar, being without rifling in the bore, throws its shell hurtling through the air, turning end over end but gradually assuming the desired position of fuse-head foremost in its flight. Firing is done as rapidly as the shells can be dropped into the mortar, which usually means that ten or more shells may be in the air at one time, between firing and striking.

Fig. 1 shows the shell parts separately and in partial assembly. In the middle of the row of parts is the casing. At the right are the base and the cartridge container, separate and screwed together ready for screwing into one end of the casing. On the left are the head, the temporary plug, the booster jacket, and the assembly of the three, ready for screwing into their end of the casing.

The assembled shell then has a base and external cartridge container at one end, and a head with internal booster jacket at the other. The base end does the mortar work of throwing the shell; the head end does the work of bursting the shell when it strikes. There are six explosions in the complete operation, three in firing and three in bursting.

The cartridge container receives a standard 12-gage shotgun shell, loaded with ballistite powder only. Around the cartridge container are placed rings of ballistite powder in silk bags of "dough-

nut" form—two to four rings, according to the distance the shell is to be thrown. It is the shotgun cartridge cap which is fired by striking the firing pin in the mortar, this first little explosion fires the ballistite powder in the cartridge, and this in turn, through the radial holes in the cartridge container, fires the ballistite rings to project the shell.

A fuse head, screwed on in place of the temporary plug in the head end, is so made as to explode whenever the shell strikes after it leaves the mortar. In thus exploding, the fuse head detonates a charge of high explosive in the booster jacket, and this in turn sets off the main load of explosive with which the interior of the casing is loaded.

Assembling the Shell

The foregoing notes as to the use of the shell have no essential part in the story of the assembly work, other than to show that, while a very simple combination of only five essential parts (not counting the temporary plug), there are requirements for accuracy in diameters, concentricity of cartridge container, etc., and necessity for careful work in other features, to produce a shell which shall be "sure fire" in every respect. Close inspection of all parts and at all stages of the assembly, is therefore an important item.



Fig. 3—Thread Inspection of the Casings, and Inspection Ways for Smaller Parts. Each time a light flashes an operative places a part on the belt



Fig. 4—Five-Head System of Machines for Spraying the Interiors of Casings with Varnish. Thence they go to a drying oven

As already stated, the parts came to the assembling plant as finished product, no machining being done there except in connection with the salvage of rejects. To concentrate the inspection work most effectively it was done wholly at the assembly plant.

Casings were of special lap-welded steel tubing, 3 3/16 in. outside diameter and 0.175 in. thick, threaded internally at each end. Bases and heads were malleable iron castings, turned to accurate diameter, finished on inner faces and threaded as required. Cartridge containers were machinery steel, finished all over and with radial holes drilled. Booster jackets were of drawn steel. Temporary plugs were of soft metal alloy, threaded only.

Receiving and Cleaning the Parts

Casings loose, and other parts in boxes, were received and stored adjacent to the starting end of the assembling process. All parts were cleaned by passage through Niagara washers for the removal of grease and dirt, whence they rolled on ways, passing workers who inspected for internal rust and who scraped out any they found; then others who brushed a little kerosene on the internal threads.

Parallel inclined belt conveyors, one for the casings and one for boxes of the small parts, carried the cleaned parts to the second floor of the

next section of the plant, where the actual assembly began. A feeding device at the lower end of the casings conveyor was timed with the cleats on the belt. The conveyors were subject to independent clutch control by workers at the delivery heads (Fig. 2), where the casings were received by a narrow horizontal belt, while the boxes of parts were passed by gravity rolls to their respective inspection conveyors. All gravity rolls were supplied by the Standard Conveyor Co., St. Paul, Minn.

Company Inspection of Parts

At the left in Fig. 2 the passing casings were gaged for length, those rejected for over or under length being taken out for sending—as were all other rejected parts throughout the assembling process—to the salvage department on the floor below. The casings, within the allowed limits of length, 1/16 in. over or under, then passed to the thread inspection (Fig. 3). They were fed by an inclined elevator to the lower run of a double-chain flight conveyor, whence they dropped into any of the ten inspection chutes which would receive them. Such as were carried past the last chute were returned by the upper run of the conveyor for repeating the travel until they found chutes to receive them. At the lower ends of the chutes the casings are held in clamps while operatives tried thread gages



Fig. 5—Where Cartridge Containers and Base Castings Were Screwed Together, First by Hand and Then by Rotating Disks



Fig. 6—Assembled Cartridge Containers and Base Castings, Trayed in Dozens, Are Being Carried to Point Where Inner Faces of Bases Are Varnished

in both ends of the casings. Correctly threaded casings dropped on to the conveyor belt for passing to the next process, while rejected ones were taken out and placed on another belt which fed them to a reverse elevator for lowering to the salvage room.

Paralleling the casing thread inspection were the inspection ways for the smaller parts. These parts, taken from their boxes, were placed by hand into gravity rollways in which they passed inspection for their threads and important dimensions. The emptied boxes were placed on an inclined gravity roll conveyor overhead for return to be refilled at the washers.

Duplicate Government Inspection

Every inspection by the company was duplicated by Government authorities using equipment and methods practically the same. Company limits of variation were, however, made more exacting than Government requirements, so that the Government rejections were held well below the allowable limit of 5 per cent.

Inspection of parts being the starting point for the work of the entire plant, there was located in that department the timing scheme for governing the speed of progress and the proper correlation of the various operations. This was accomplished simply by a system of small electric lamps, which could be made to flash at such in-

tervals as would give the proper timing for the respective parts. The operative at the right in Fig. 3 has an electric bulb before her and for each flash of the light she places one or more cartridge containers on the belt which carries them from company inspection to Government inspection. In the days of intensive operation the length of the interval between flashes of the lights was varied to speed or retard the rate of production so as to maintain the set schedule for delivery of finished work, according as hourly reports showed deliveries lagging or leading. This arrangement was the means of assuring a scheduled production every day. The easier pace of later days was then kept properly uniform throughout the day by slower use of the same device.

Sub-Assembly of Small Parts

Having passed from the Government inspection inclosure the small parts were sub-assembled into base and head ends complete, and casings were prepared to receive them.

The casings, handled by a system similar to that in the thread inspection work, were delivered to a 5-head system of Devilbiss machines (Fig. 4), for spraying the interior with copal varnish, to prevent rust and to avoid contact with the explosive when loaded. Thence they passed to a belt on which they were carried to a Young



Fig. 7—Two Conveyors for Carrying Bases and Heads, These Being Ready for Screwing Into the Ends of the Casings

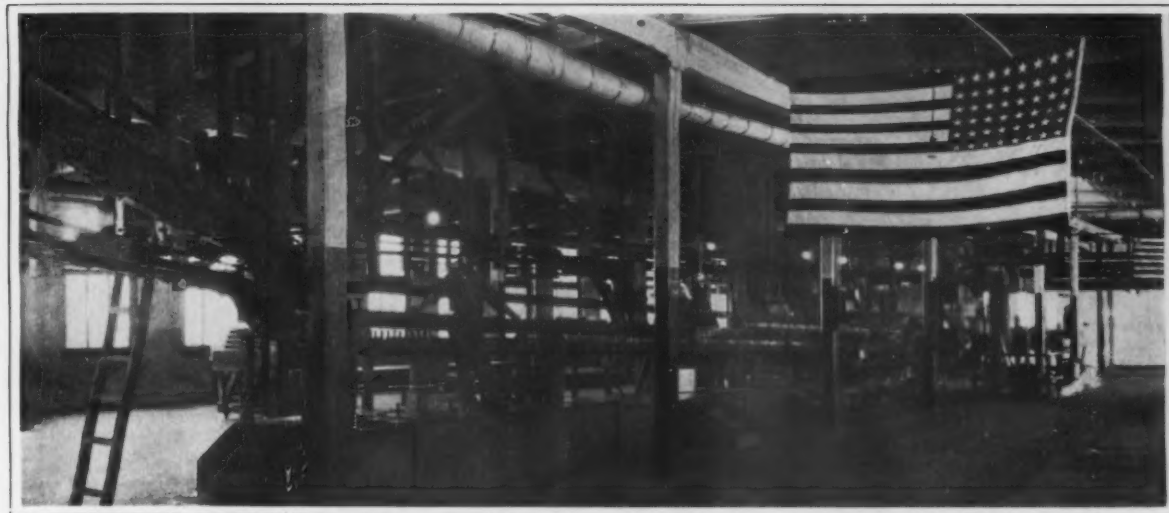


Fig. 8—The Casings, Carried Beyond the Bases and Heads by the Length of the Drying Oven, Are Conveyed Back Over the Conveyors for the Smaller Parts, Then Descend to a Rollway Over These Parts

Brothers drying oven. Traversing the length of this oven, carried on a steel slat conveyor, supplied by the Palmer-Bee Co., Detroit, they were again inspected and received light applications of oil on their threads, and then were elevated to a cross conveyor for delivery to final assembly.

The small parts as they came from Government inspection were brought together in proper combinations for sub-assembly of bases and heads—base castings with cartridge containers, and head castings with booster jackets and plugs.

The cartridge containers were first varnished inside, at the thread end only, by spray guns inserted at the plain end. They were then elevated to meet a cross conveyor bringing over the base castings (Fig. 5) and the two were screwed together, being started by hand and run up tight by holding against rotating disks. Then, trayed in dozens, they were conveyed along (Fig. 6) for the varnishing of inner faces of bases, after which a belt carried them to final assembly.

Similarly, the head parts were brought together by conveyors from Government inspection. The booster jackets, inserted by hand in the head castings, were forced into place by a heavy press, which peened the metal of the casting tightly around the booster jacket. Any which were loose after passing this press were swaged tight by hand. Inspection eliminated the imperfect ones, which were rejected to salvage below.

The threads were oiled and the temporary head plugs, started by hand, were run into place by machines having slots in the ends of their spindles to engage cross ribs in the plugs. The heads were then trayed up in dozens and their outer surfaces—which are the interior surfaces when the shell is assembled—varnished by hand as the trays passed on the conveyor to final assembly. Long conveyors provide for the partial setting of the varnish, thorough hardening of which is not necessary, since the varnished surfaces are inside when assembled.

Final Assembly

In Fig. 7 is shown the two conveyors for trays carrying bases and heads, ready for screwing into the ends of the casings. The latter had been carried far beyond by the length of the drying oven, so, for the final assembly (Fig. 8) they were conveyed across the room and back over the two conveyors for bases and heads, where they descended to a rollway immediately above these parts. Thence all three items of the final assembly traveled together, casings rolling on ways, bases carried in trays on gravity rolls just beneath, and heads in trays on gravity rolls still lower.

Workers on one side of the triple-deck system (Fig. 9) picked casings from the rollway and started into them the bases picked from trays

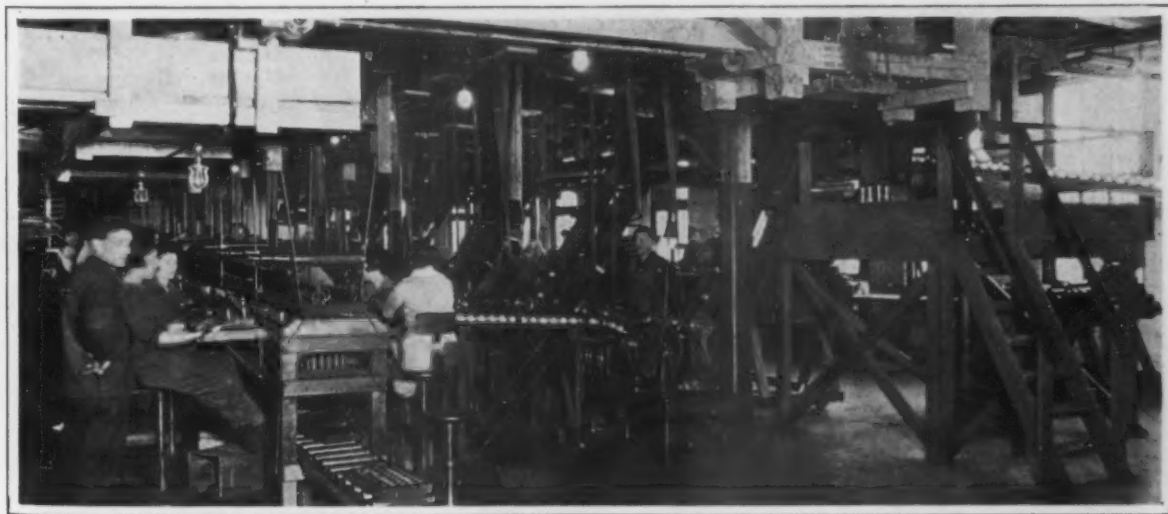


Fig. 9—A Triple-Deck System of Conveyors. Here casings are picked from a rollway, and bases started into them by hand. Five machines then run bases into place



Fig. 10.—Oven Through Which Casings Were Conveyed After a Painting Machine Had Sprayed Their Exteriors with Gray Paint

taken from the gravity rolls. The casings, with started bases, were laid on an apron above the casing rollway, whence workers on the opposite side took them and similarly started the heads into place.

Five machines, with shafts rotating in opposite directions, then ran the heads and bases into place, under control of air-actuated cone-clutch grips which allow slippage if the parts do not go together properly. Elevators from these machines delivered the assembled shells to a conveyor, whence they passed to a rollway which fed them to a painting machine which sprayed the exterior of the casing with a coat of gray paint. This dried as the shells passed slowly through a drying oven (Fig. 10) on a Palmer-Bee Co. steel slat conveyor. In this passage they were subjected first to heat and finally to a cold blast of air from an overhead blower.

Assembly Inspection

Coming from the paint-drying oven the shells were complete and ready for inspection, marking, oiling and packing for shipment, the equipment for this work being in duplicate, and each shell going through one or the other of twin lines of rollways from oven to shipping conveyor. In this department there was no distinct separation of company and Government inspections, but

each company inspection for any one feature was followed immediately by the Government inspection for that same feature.

On the two rollways running from the oven delivery, the shells passed inspection for tightness of ends, depth and bore of cartridge container, shell length and weight.

At the end of these rollways the shells were elevated sufficiently to give them proper height for rolling again, to a point where they were inspected for concentricity of the cartridge container, and to another for hammer-and-die stamping of three marks upon the outer edge of the face of the head casting; first, the lot number and date; second, the maker's initials, GMC; third the Government ordnance department's familiar device. Thence the shells rolled through oiling machines for doping the entire exterior.

Packing and Shipping

At this point the boxes in which the shells were to be carried to and through the loading plant and to the mortar for firing at the battle front were brought by a long belt conveyor from storage in an adjacent shed. This belt discharged to a short belt in the packing room, where the sliding covers were removed and the boxes placed on gravity rolls, on which they passed beneath oiling machines to receive their oiled shells, three



Fig. 11.—Noticeable at the Right Are Three Reverse Elevators for Lowering Defective Casings to the Floor Where They Were Corrected

in each box. The covers were here replaced, and each stamped with its lot number and maker's initials, then chalked with the serial number of the box in the lot. The maker's count for each lot was 2001, of which there was an allowance of six for test firing, thus leaving a Government count of 1995. End compartments in the boxes received the fuse heads, boosted jacket charges, ballistite rings and firing cartridges at the loading plant.

The boxes, thus covered and marked, passed on gravity rolls to a chute, whence they ran on further gravity rolls to the shipping shed where

their respective faults. Other parts descended through spiral chutes, each of which represented a particular sort of defect, so that all parts which it brought down were subjects for the same corrective measures. In Fig. 12 is shown the heaviest of the salvage machinery—swaging presses for head and base castings which could be benefited by a pressure treatment.

A Well Planned System

To devise and install this elaborate system, with its exacting requirements for harmonious functioning of its many parts and operations, re-



Fig. 12—Swaging Presses Which Were Used for Correcting Faults in Head and Base Castings

a belt conveyor fed them to three leads of portable gravity rolls which carried them directly into box cars for shipment.

Salvage of Rejects

Complete equipment was provided for the salvage of such rejected parts as might be corrected and made to conform to requirements. This department was beneath the assembly system, so that the rejects descended directly to it. Along the front wall (Fig. 11) are the three reverse elevators by which the casings were lowered to rollways whence they were taken for correction of

quired a high degree of engineering judgment and experience. The success of the plant in overtaking and passing its necessary schedule is proof of the manner in which its designers suited the means to the need, and of the success with which the combination of efficient equipment and trained personnel worked out its purposes.

The distance of travel in direct lines from receipt of separate parts to delivery of finished shells to cars was about 900 ft. Actual inspection, assembly and marking, to the point of oiling and placing in boxes involved a horizontal travel of somewhat more than 500 ft.

Buys Shell Forgings—Material for Sale by the Government

The I. Gerson & Sons Co., Toledo, Ohio, has purchased through its Detroit office approximately 70,000 tons of steel shell forgings from the Ordnance Department. This material is located at the Detroit Shell Co., Detroit Steel Castings Co., Hayes Mfg. Co., American Car & Foundry Co., Ford Motor Co., and Dodge Bros., Detroit, Mueller Metals Co., Port Huron, Mich., and the Marble Arms & Mfg. Co., Gladstone, Mich. The same company has also purchased the entire Government supplies of the Imperial Shipbuilding Corporation, Detroit, including boats, ship hardware, supplies, steel plates, shapes and angles.

Below are some of the larger tonnages of iron and steel material being offered by the Government through the Ordnance Department by means of sealed bids:

Detroit office, 400 tons of 75-mm. shell forgings at the American Machine Corporation, Port Huron, Mich., bids to be in by 11 a. m., July 7. Philadelphia office, 92 tons of strip steel at the General Pressed Metal Co., 1524 Hancock Street, Philadelphia, bids to be in by 11.30 a. m., July 7; 1980 tons of low phosphorus pig iron at the Standard Steel Works Co., Burnham, Pa., bids to be in by 11 a. m., July 8; 1120 tons low phosphorus pig iron (Northern) at the Standard

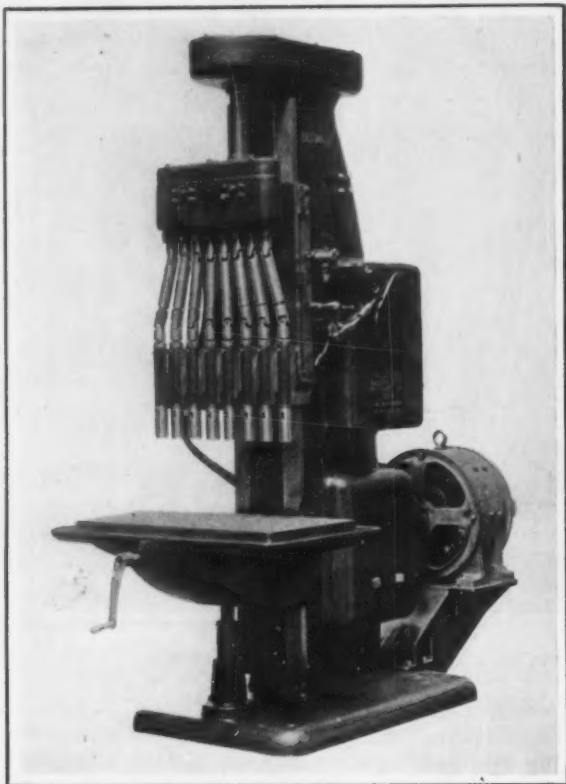
Steel Works Co., bids to be in by 11 a. m., July 8; 228,000 ft. seamless steel tubing at United States Eddystone Rifle Storage Arsenal, Eddystone, Pa., bids to be in by 12 m., July 8; 1415 net tons 1½-in. round bar stock at Eddystone, Pa., bids to be in by 2.30 p. m., July 7.

Rochester office, 104 tons of steel plate at the Bossert Corporation, Utica, N. Y., bids to be in by 12 m., July 10. Bids for the following material at the Remington Arms U. M. C. Co., Ilion, N. Y., will be opened at 12 m., July 7; 7½ tons of music wire, 1264 tons of 3½ per cent nickel steel, 200 tons of commercial cold-rolled strip steel, 94 tons of screw stock steel, 1115 lb. of ribbon spring steel, 1533 tons of carbon steel, 786 tons of 3½ per cent nickel steel, and 294 tons of soft steel; 684 tons of 75-mm. forgings and 1997 tons of 155-mm. forgings at the New York Air Brake Co., Watertown, N. Y., bids to be in by 12 m., July 9; 1857 tons Gothic sheet-steel billets at the Donner Steel Co., Buffalo, bids to be in by 12 m., July 11. Bids for the following will be opened at 12 m., July 12: 315 tons of cold-rolled steel at Champaign Bros., Ithaca, N. Y.; 177 tons of cold-rolled round steel and 59 tons of head forgings for 75-mm. shrapnel, both at the Symington Machine Corporation, Rochester, N. Y. Bids for the following material at the Atlas Steel Casting Co., Buffalo, will be opened at 12 m., July 15: 480 tons of cold-rolled strip steel, screw stock, and hot-rolled forging steel, 896 tons of 9.2-in. common steel shell forgings, 1070 tons of base plug forgings of common steel; 1993 tons 9.2-in. common steel shell forgings at the Donner Steel Co., Buffalo.

Multiple Spindle Drilling Machine

A multiple spindle drilling machine with straight line adjustable spindles is announced by the Defiance Machine Works, Defiance, Ohio. The machine can be equipped with a group of spindles with fixed centers arranged in a straight line or in a cluster, or with a group of universally adjustable spindles arranged in a straight line, a rectangular or circular cluster.

The speed mechanism is located in the column near



This Multiple Spindle Drilling Machine Has a Capacity of Eight $\frac{3}{4}$ -in. Holes. The minimum distance, center of spindles, is 2 in. and the maximum distance 22 in. The maximum distance from the nose of the spindle to the table is 32 in. and the table has a vertical adjustment of 12 in. There are six spindle speeds ranging from 110 to 344 r.p.m.

the base so as to absorb the vibration. Power is transmitted to a vertical drive shaft from a three step cone pulley through back gears and bevel gears. A Johnson friction clutch is used to engage the power and to select the back gear, and these back gears when used with the three step cone pulley allow six speed changes. The vertical drive shaft is fitted with a sleeve gear through which the spindles are driven, and this sleeve gear is made to slide along the drive shaft with the spindle head as it is fed either up or down, which construction provides a drive closely coupled to the spindle head at any position on the column. Back gears are unnecessary when the machine is arranged for a direct connected variable speed motor.

The feed mechanism is driven from the drive shaft through bevel gears, and is housed in the column above the speed mechanism. It consists of two friction clutches and a jaw clutch. By engaging one of the friction clutches the spindles are rapidly advanced until the drills come in contact with the work, at which point the jaw clutch is automatically engaged to feed the drills through the cut. When through the cut the other friction clutch is automatically engaged to effect a quick return of the spindles to the starting position. The levers operating these clutches are interlocking, thus to prevent more than one clutch being engaged at the same time. Feed changes can be made by removing a gear case cover and changing two gears.

The feed screw is operated by the feed mechanism through a vertical drive shaft and a train of spur gears. The threads on these screws are engaged by a bronze nut, which is located low in the spindle head to

prevent the threads from being exposed when the head is fed to its lowest position on the column. The advantage of this screw feed which is located directly above the work, it is emphasized, lies in obtaining a vertical feed thrust in central alignment with the spindles, thereby eliminating side thrust to the spindle head and column ways and maintaining them in their original true alignment for a long period of use.

The spindle head is gibbed to the column by a square lock method. This head supports the spindles and retains the spindle drive gears. Each spindle when arranged to be adjusted, either universally or in a straight line, is connected to the drive gears by a telescopic drive shaft fitted with universal joints. When the spindles are arranged with fixed centers they are connected with the drive gears in a more direct manner without universal joints.

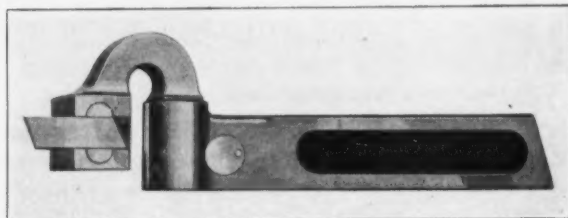
The manufacturer states that the table can be furnished in either a knee or box type. The knee type is adjustable vertically. The box type table is made with its top surface provided with T slots to which the work or a jig can be clamped.

The oiling consists of a force feed, gravity flow and splash system combined. The speed and feed mechanisms taken collectively, and the spindle head separately, are each provided with independent and self-contained oiling systems.

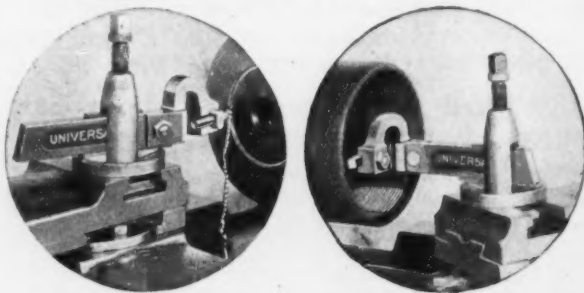
Adjustable Spring Head Tool Holder

The adjustable spring head tool holder illustrated is manufactured by the Universal Tool Holder Co., Cleveland. The tool is adjustable for any angle up to 90 deg. right or left.

The spring action of the holder is emphasized as giving a smooth cut and eliminating chatter. The manufacturer points out that the strength of the spring is calculated for light production and finishing work, and the tension is such that the tool will cut threads



Adjustable Spring Tool Holder Designed for Light Production and Finishing Work. The swivel arrangement of the head gives the tool a wide range of usefulness.



from 70 to 40 pitch. The tool is adaptable to work steel, brass or bronze, but not cast iron.

The single clamp holds $\frac{5}{16}$ in. round, $\frac{5}{16}$ in. square and $\frac{3}{32} \times \frac{7}{16}$ -in. flat bits and circular threading or forming tools on either side.

La Métallurgie states that the annual capacity of production of the existing French aluminum works is as follows: Société Electro-Métallurgie Française, 9,000 tons; Compagnie d'Alais et de la Camargue, 7,000 tons; Société d'Electricité, 1,000 tons; and Société Produits Electrolytiques des Pyrénées, 3,000 tons. The French deposits of bauxite are stated to be inexhaustible, and the fluorspar available supplies the necessary melting element.

Anti-Social, Militant Methods Condemned

Co-operation of Different Companies Through Representatives Chosen by Employer and Employees Suggested—Recasting of Industrial Institutions Proposed

BY WALTER GORDON MERRITT

THE promotion of joint works organizations of employers and employees, with a large measure of autonomy, does not deny the existence of inter-corporate problems affecting labor or the usefulness of conferences or even permanent associations between representatives of different companies. The existence of trade associations, whether of workers or employers, which have come into being by virtue of the exigencies of the situation, is based on sound experience. There must always be machinery whereby delegates from different companies may deliberate over general questions affecting the industry. But would it not be a far more normal situation if co-operation between different companies were through representatives chosen by the employers and employees of each factory, rather than by national association of employers and national unions, with their class antagonism? The problem of competitive adjustment between individual concerns would not then be treated as a class problem or a labor-capital problem, but simply as an adjustment between the competitive concerns with full recognition of the fact that the organic structure of each concern involved labor, management and capital. Under such conditions, the cleavage of our industrial structure, when considering an individual factory, would at times still be the horizontal cleavage between capital and labor, but the general industrial cleavage involved in the relation of independent and competing units would be the vertical cleavage between the individual concerns.

A Community Plan for Co-operation

A short time ago a plan of this general character was presented to me for review by an employers' association of one of our leading cities. It was proposed to establish a co-operative organization of employers and employees for the entire community, and the delegates composing the association were to be an equal number of employers and employees elected from each factory. These delegates elect a board of directors, composed equally of both interests, which directs the organization's activities through the employment of a manager. The organization acts as an employment bureau, a court of appeals for all difficulties which are not settled in the individual factories, and an authority on rates of wages and labor conditions prevailing throughout the country in the same industry. To this co-

operative bureau through which labor and capital are seeking to deal with the labor conditions of the community, every employee can subscribe on seeking employment. Behold here the actual inception of the ideal organization of which we speak. Each factory, with management and employees included, is the basic unit which sends representatives to the larger conferences. The family quarrels in each factory will ordinarily be settled on the inside.

Under such a régime our industrial society is not divided into two groups molded by the solidarity of the working class on the one hand and the solidarity of the employing class on the other, and the general problems of industry are not determined by the alignment of these two classes against each other in a state of industrial war.

Limited Use for Unions

After all, if we look upon the labor movement with its right of organization and its right to strike as simply a movement for economic equilibrium, in order to cure the disparity of bargaining power which arises between the individual worker and the management of organized capital, there may in the end be little occasion for a purely labor organization

beyond the limits of the individual factory. The normal economic relationship between capital and labor is in the individual factory; the normal economic relationship outside of the factory is between the different companies, including all interests of each company. If, of course, we look upon the labor movement as a revolutionary movement which may legitimately pit its power against government or society as a whole, there is nothing to be said except that as a last resort one of the greatest rights of the people is revolution, but the duty of the government is to resist. When labor organizations and labor disputes are viewed solely as economic movements, to place employer and employees upon something like an equal bargaining basis, in some cases at least there seems to be little gained by extending any organization or controversy beyond the walls of the immediate factory involved, provided each faction seeks and secures outside support with equal success.

In many cases it is probably true that 100 mechanics employed by one employer are in just as effective a position to make or enforce a fair bargain with their employer as they would be if they brought in 10,000 employees of other employers,

Opposed to Class Conflicts

This is the third and last article of a series by Mr. Merritt on labor problems. He believes that the economic soundness of the new idea of works organization as against the older idea of class organization and class warfare cannot be successfully disputed. He is utterly opposed to arraying one class against the other and believes in co-operation of companies through representatives chosen by both employers and employees of each plant rather than by national associations of employers and national unions with their class antagonisms. He believes that much can be accomplished by the Government working with the factory organizations. He says that if the people are to rule, we cannot go too far in educating the rulers.

Whether one agrees with Mr. Merritt or not, his views are worthy of consideration because they are ably presented in vigorous but temperate language.

provided the outside employers became equally united. In fact, if we eliminate the anti-social power and effects, the facilities of employers' associations probably place the advantage of extending the movement beyond the immediate factory in interest on the side of the employers. This is not a theory but seems to have been borne out by actual experience. Employers' organizations formed in some trades to resist the aggressions of certain unions where both the employers' association and the national union are about coextensive with the industries they cover, have been successful not only in preventing the growth of that union in the factories of their members but have generally depleted its strength, resources and influence. The organization of these enormous class movements has in some instances at least gained nothing in the long run over what would be gained in individual factory organization except in so far as they seek anti-social and militant ends.

New Idea Sound

No one can successfully dispute the economic soundness of the new idea of works organization as against the older idea of class organization and class warfare. No one can disguise the fact that in any country where social peace and co-operation prevail, each manufacturing establishment is the normal unit of economic self-interest for the workers. If, by reason of closer co-operation and greater mutuality of interest, the worker's loyalty to the individual company were to become stronger than his sense of class consciousness and class solidarity, then *ipso facto* the class conflict and social disunion as we now see it will disappear. Is it feasible to gradually share advantages with the workers in each factory to such an extent as to effect a transfer of their allegiance to the productive unit in preference to the interests of general class warfare? And, if feasible, have the employers sufficient vision to do this with sufficient promptness? That is, of course, debatable. But one thing is certain—society cannot continue in a static condition while important sections of it are in conflict and just as with the laws of Mother Nature, one force will work against the other until by attrition or more violent upheaval the point of conflict or friction is altered or relieved. Using natural laws as analogies may be as misleading as it is pleasing, but in this case it seems justifiable to point the moral that the erosive forces of social and industrial antagonism—if they don't pulverize—will inevitably produce a metamorphosis before we can hope to reach a state of equilibrium. Nothing but a blind denial of natural laws and complete forgetfulness of elemental forces can dispute this. The present conflict will go on until there is a readjustment which is generally accepted as more satisfactory and the only practical question is the method of readjustment. What will be the path of evolution, or revolution, as the case may be?

Spirit of Class Solidarity

If the workers do not secure a larger measure of their desires in the individual shops, they will continue to be inspired, in even greater degree by anti-social, semi-revolutionary sentiments, to join with others of the class similarly situated, in order to wrest advantages from society and the employers. When a large body of people believe they are entitled to more than they are receiving and are able to take it, there remains little doubt as to their objective and its capture. The workers will receive more recognition before industrial forces between capital and labor reach an equilibrium and they will get it either through voluntary recognition in the

individual factory or through the compulsory methods of anti-social, militant class-unionism. To avoid resort to the methods of antagonism the employers must compete with the spirit of class solidarity for the preferential allegiance of their employees.

Employers Misinformed

Employers are frequently deluded as to the mental attitude of their employees and feel that they have successfully secured their loyalty until lightening strikes and disillusiones them. Perhaps they have no reason to know better when an occasional employee at whom they casually peer a question assures them that they are satisfied with the wages and hours which prevail and are grateful for the welfare work which is being carried on. But these are undependable assurances, for the same workman will often convey a contradictory story to the union delegate, and if occasion arises to take a controversy to court the witness stand frequently finds most of the men against the employer. Under present-day conditions, few concerns are beyond the reach of a volcanic outburst. In the long run but few can hold their employees when under favorable conditions the call of class solidarity is sounded. Is it possible to change all this and to substitute in the majority of factories harmonious working organizations of the management and workers where the centripetal forces will be greater than the centrifugal? Can we not substitute factory solidarity for class solidarity? If the feeling of industrial injustice and class hostility is mitigated, the natural economic union and the center of cohesion is obviously the productive unit. If, through the leadership of the liberal wing of employers in directions already in evidence, the solidarity of this productive unit can be maintained as against the disintegrating effect of class solidarity, all is well; if not, the problem is disturbing indeed. Disunion and disintegration are the harvest of any society which arrays one class against the other. "A house divided against itself cannot stand." The class alignment must be broken up by recasting our industrial institutions. I use the word advisedly. It *must*. It is only a question of means whether it should be done through peaceful methods or whether the change will be brought about through methods of disorganization.

Militant Unit in England

In England the development of the national militant union has gone so far that the choice of remedies is more limited than in the United States. The employers did not awake to the seriousness of their situation until some of the most important trades and utilities had so completely fallen into the hands of powerful militant unions that even the Government could not withstand their demands. The lodging of monopolistic control of industry in the hands of a single union which is capable of eluding or resisting the regulation of the state, is bound to result in the suspension of the orderly processes of democratic government. Where the wishes of that union are at stake, the affair will not be settled by resort to pure reason. The Coal Miners' Union informed the British Government that no coal would be mined in the kingdom unless the mines were nationalized, and while the issue is still in flux, the workers have gained much of this demand and bid well soon to secure the rest. In this country there is still such a large amount of coal mined by independent, non-union mines that society could not be "held up" in quite the same way. Taking our population as a whole, there is about one union man for every 30 inhabitants, while in Great Britain there is about one for every eight or nine. During

the war it appeared that 90 per cent of that part of English industry upon which the nation was particularly dependent was unionized, while in this country 90 per cent of it was open shop or non-union. Where the machinery of industry has so completely fallen into the power of centralized labor organizations as in England, the country must "watch its step," and in handling these organizations democracy becomes more theoretical than real.

Power of the Old Unions

It is probable that this high degree of organization in British industry, which was one of the established conditions on which the Whitley Committee was obliged to build, made it impossible to extend industrial government along ideal lines, where each factory acting as an industrial republic with a joint works committee of employers and employees, would send their delegates to district and national councils without the need of national organizations of workers and employers conducted for class war purposes. The Whitley Committee was positive that it must not be felt in either organized or unorganized industries that works committees "were in opposition to trade unionism" and that "such fears should be guarded against." It is obvious from the report that the power of the old-established unions was so great that the committee would not countenance any independent movement among the workers which would subject those unions to any kind of rivalry, however wholesome. The old class cleavage was recognized as something which could not be recast, for the committee found it necessary "to secure the support of the trade unions and employers' associations concerned," by providing that all councils "should be composed only of representatives of trade union and employers' associations and that new organizations should be admitted only with the approval of the particular side of the council of which the organization would form a part." It stated that plans for district councils should "be a matter of agreement between these organizations." From this it follows that no kind of rival labor organization will be allowed to participate. Exclusive and monopolistic control will be given to those already in existence. If the men in any one factory desire to form their own union to act independently of the old organizations, the existing organizations in the governing council will treat it as an outlaw. The ideal plan of encouraging democracy in the individual factory and developing district and national organizations from the ground up, through the joint action of management and workers in each factory, was not adopted. The employers' commission appointed by our Department of Labor to report on English conditions confirms this point of view, for it finds that "employers nearly all agree that collective bargaining should always be undertaken between associations of employers and the regularly established well-organized trade unions." American employers who are initiating machinery for factory representation independently of the old-time labor unions, will be loath to believe that it can only be undertaken under the auspices of the older unions. They are glad to hear from the same employers' commission that it is a problem how to keep shop committees "under the control of the larger labor organizations." The War Labor Board certainly proceeded on the theory that independent organization was not desirable. Numerous employers of this country are so aroused by the misdeeds and impracticable methods of some of our unions, that if they become satisfied that collective bargaining can only thrive through the agency of those unions, they will oppose it to the end. The best

chance for the newly organized movement lies in the belief of many employers that it is something more efficient and friendly than the existing conditions of strife and disunion and will lead to a higher social service. They must still be convinced as a class that the new idea will serve the cause of production rather than class warfare.

Opportunity for American Employers

So far as this discussion is concerned, the employers in our country are where the English employers were decades ago and are therefore afforded a fortunate glimpse into the future which awaits them and the nation if they follow the same course. Will they not profit by this and endeavor to create a factory solidarity more attractive than class solidarity? Will they not convince the workers by actual demonstration that they can gain more through co-operation with their individual employers than by the militant, anti-social methods of class conflict? Upon the answers to these questions depend the growth and success of the wholesome factory organization, constructed for the purpose of service, as against the more militant type of unionism which, in the majority of cases depends primarily on force and class conflict. The chance still remains in this country to avoid the English blunders by erecting an industrial government wherein associated activities beyond the walls of the individual factory and intercorporate adjustments affecting labor will be largely conducted by delegates from each factory rather than national organizations of employers and employees.

Labor Turnover and Factory Loyalty

One factor which will do much to promote the cause of intrashop solidarity and organization is the intense effort being made to eliminate excessive labor turnover. To minimize turnover is to increase the number of employees who will become more permanently connected with an individual concern and to reduce the volume of migratory labor. This means decreased restiveness and increased loyalty. The employers, impelled by self-interest, are now fully alive to the importance of this line of effort both for the purpose of stabilizing their working organization and avoiding the waste which comes from breaking in green hands. Magnus Alexander, whose authoritative studies will not be questioned, has pointed out that it costs from \$20 to \$300 every time a new employee has to be substituted for an old one, and when we know that the annual turnover in some plants has run as high as several hundred percent, the magnitude of the loss to the employer and society—to say nothing of its effect on the employee—is but a matter of arithmetic. To meet this problem, employers are keeping careful records which by analysis furnish them with accurate information on the leading causes for the quitting of individual employees, and are directing their organizing ability to their elimination. The next decade will work dramatic changes in this respect and will discover a large number of companies operated by a majority of employees, who, speaking generally, have become permanently attached to the one factory organization. This is one of the most encouraging factors leading toward factory solidarity, and, coupled with the new attitude of management, which respects the human element, contains possibilities upon which all will delight to speculate.

Government Co-operation with Works Organizations

If such a system of industrial organization is erected in our open shop factories, the Government

will of necessity be compelled to recognize it to the extent of its numbers and influence. To-day, if occasion arise to appoint representatives of the workers on a war labor board, an industrial relations commission, or to any labor department, State or Federal, the only existing agency for organized expression on behalf of the workers is the old type closed-shop union. Inability to acquire recognition for independent unorganized labor has proved one of the great embarrassments of the past. American employers have railed against the selection of unionists to represent all labor, when union labor, they assert, represents only 20 per cent of labor, but they inevitably failed to indicate any satisfactory means by which organized labor could be represented. Until we reach a point where independent labor can have some effective machinery for collective expression, the shaping of our Governmental labor policies will depend largely on closed-shop unionism and 80 per cent of labor will continue to be disfranchised. If the 80 per cent become organized into a new type of unionism which could be speedily brought about by the encouragement of the open shop employers, the political factors also will change unless the call of class solidarity proved too strong and the new organizations so started are completely swallowed up by the old—a most unlikely event unless the old unions reform.

National Benefits

The establishment of harmonious co-operative organizations in the individual factories, if it succeed, will have favorable national consequences in more ways than one. The workers have been taught co-operation and union in militancy and strife. The new organization teaches us the same lesson in a finer service. Mutual co-operation and good will

among men in industry will greatly improve the morale of the nation. To quote again from an English report:

"The spirit in which both employers and employed regard their common work will color not only their relations to each other but their general attitude to the corporate life of the nation."

Works organizations, unlike national unions, educate the rank and file in the practical problems of industry by placing responsibility upon them and thereby bring the practical lessons of democracy directly home. Practice in the use of the ballot, and actual observation of the processes of representative government, in each factory where the problems are comprehensible and the results apparent, will quicken the imagination and improve the intelligence in the exercise of the political ballot. The gulf between Government and its subjects may be decreased by a better understanding of this relationship, and democracy in industry which in the order of events has followed political democracy, may become the primary school for the development of the capacity of self-government. To-day many men cast their ballot with no real appreciation of its significance and with an indifference as to results. If the new processes of self-government and the group sense could be worked out in the factory, where so many of our citizens spend so large a portion of their waking hours, and where their self-interests are so largely centered, it is not an unfair speculation that it will develop a new community sense and that new hostages will be given to democracy. Once we have decided that the people are to rule, we cannot go too far in educating the rulers.

DIRECTOR HARE ATTACKED

Salary Is Limited—Business Men Not Easily Obtained by Government

WASHINGTON, July 1.—Activities of the office of the Director of Sales of the War Department have formed an engrossing topic for both houses of Congress recently. The department's plans for the disposal of surplus materials valued at \$3,500,000,000, of which \$2,000,000,000 worth is in this country and \$1,500,000,000 abroad, have been subjected to a daily bombardment by members of Congress. The attack was begun in the House Military Affairs Committee when the department first made its request for an item of \$1,000,000 in the Army appropriation bill for the expenses of the office of Director of Sales. Members of the House continued the fire on the floor during the consideration of the bill. The Senate Military Affairs Committee then took it up and finally there were outbursts on the floor of the Senate. The Congressional Record is loaded down with thousands of words of matter relating to the surplus material situation.

C. W. Hare, of Philadelphia, who has the title of Director of Sales, has been the principal target. The \$25,000 salary paid him by the War Department was the chief bone of contention. The Senate finally inserted a proviso that no salary should be paid out of the appropriation in excess of \$12,000, the senators figuring that an employee of the War Department ought not to receive more than the Secretary of War, even though his task was to dispose of surplus materials valued at billions of dollars.

In order to justify his efforts, Mr. Hare had prepared a number of reports from his subordinates, giving a glimpse of the work done thus far and citing some instances in which savings were effected. A memorandum from Major A. L. Mercer, chief of the raw

materials and scrap section, to Mr. Hare, tabulates the savings of money in the disposal of various metals through the activities of his section.

Mr. Hare had some strong defenders in both houses, as well as critics. Senator Wadsworth, of New York, chairman of the Senate Military Affairs Committee, and others, declared that the War Department would only be able to dispose of its huge surplus stocks without seriously affecting market conditions, and to the best financial advantage by employing such men as Mr. Hare and paying them comparatively large salaries.

Senator Wadsworth insisted that Mr. Hare was especially qualified. It was explained that when Mr. Hare became director of sales the Assistant Secretary of War arranged with the Philadelphia company to have him given a year's leave of absence without pay. His salary was fixed at \$25,000, because of the fact that he was giving up not only a salary of \$15,000, but other earnings equal to an additional \$14,000.

Mr. Hare stated that he was emphatically of the opinion that it would be a serious mistake to attempt to turn the supervising control of the sale of surplus materials over to the Army or to have the work done except by business men specially qualified for the work. He said he had found it exceedingly difficult to persuade men engaged in active business who would be qualified to aid him in his work to leave their business, no matter what salary was offered them, and if the salaries were reduced it would be practically impossible.

Glenn Peters, assistant counsel for the Emergency Fleet Corporation, has filed in the United States district court at Chicago a suit for \$250,000 against the Mobile Ship Co., on behalf of the Federal Bridge & Structural Co., Waukesha, Wis. The claim is for profit on a subcontract in connection with the construction of 18 composite vessels, costing \$500,000 each, for which the Federal company was to furnish the fabricated steel.

Deep Etching and Rail and Forging Defects*

Cracks Developed by Pickling Found in Rails Failing from Transverse Fissures, Also in New Rails and Tires

— BY F. M. WARING AND K. E. HOFAMMANN —

THE origin and development of the defects known as internal transverse fissures which are the cause of a certain type of rail failure have been a matter of much discussion, and different authorities have offered various reasons for the existence of these defects, such as: impurities in the steel, gagging, internal stresses resulting from non-uniformity of cooling of the rails, internal stresses set up in the rail while in service under the moving wheel loads, etc.

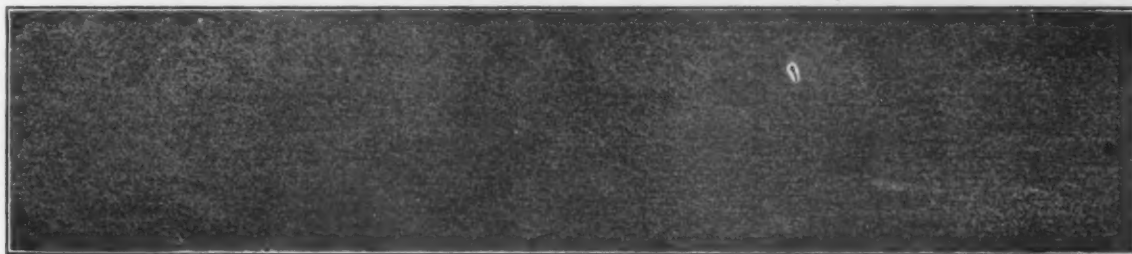
In some of the many investigations that have been made upon rails which failed due to transverse fissures,

detected under the light etching to which this slab had previously been subjected. This specimen was from an old rail which had been in the track for about five years, and the entire heat, consisting of 61 rails, had been removed on account of a number of failures from transverse fissures. Similar treatment of slabs from other rails in the same heat which had shown transverse fissures also gave the same indications to a greater or less degree, there being apparently some improvement in the appearance of the steel and a smaller number of defects opened up under the action of the



Fig. 1—Specimen from Old Rail That Showed 12 Transverse Fissures. Reduction one-half. Etching of this and the other six specimens was with 9 HCl 3 H₂SO₄ and 1 H₂O at temperature of 200 deg. Fahr.

Fig. 2—Specimen from Old Rail That Had No Transverse Fissures. Reduction one-half



etchings of transverse specimens have shown the existence of small cracks located principally near the center of the head, but none of the reports containing reference to such cracks attempted any explanation of their presence, or carried the investigation far enough to show that similar cracks could be found on etchings of longitudinal sections through the head of the rail. It was in attempting to investigate the nature of these small cracks appearing in transverse sections of the rails that we were led to extend our investigation to include longitudinal sections about 1/2 in. thick and 18 in. long taken from the center of the rail head. Light etchings of such sections did not develop any defects and the etching process was then continued with concentrated acid with results that were to us very surprising and wholly unexpected.

Both Longitudinal and Transverse Fissures

Fig. 1 shows the appearance of such a slab from a rail which had developed twelve transverse fissures when broken under the drop test. This specimen was etched for two hours in a hot solution of 9 parts hydrochloric acid, 3 parts sulphuric acid and 1 part water. The action of the acid has opened up both transverse and longitudinal fissures whose existence could not be

acid for those rails which showed only a few transverse fissures when broken under the drop test.

Fig. 2 shows the appearance of a deep etched slab from one of the rails which did not contain any transverse fissures. This section is entirely free from any of the cavities which were opened up in the specimen mentioned above.

The existence of these defects in rails which had developed transverse fissures and the failure to find them in rails from the same heat of steel which had been subjected to the same traffic conditions suggested that the investigation should be extended to include new rails. Fig. 3 shows the deep etching of a slab from a new 125-lb. rail, and Fig. 4 from a new 130-lb. rail, which had never been in the track. Both of these new rails contain a number of defects similar to those found in the old rails.

Deep Etching of Tires and Wheels

The results of deep etchings on rails led to the conclusion that some of the trouble that is experienced with the breaking of steel tires might be due to the presence of similar defects. A new locomotive trailer wheel tire, which had made only about 25 miles before breaking, was cut into tangential and radial longitudinal slabs through the center of the section and these were deep etched with the hot acid solution with results as shown in Figs. 5 and 6.

*A paper read at the annual meeting of the American Society for Testing Materials, Atlantic City, N. J., June 25, 1919. The tests described were made at the Pennsylvania Railroad laboratories, Altoona, Pa.

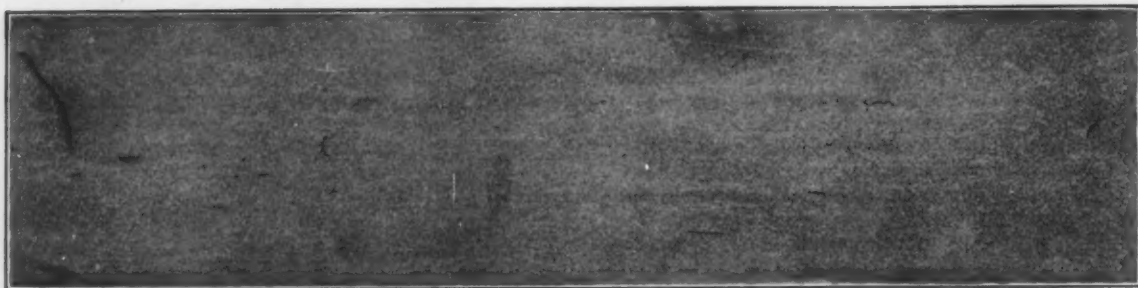
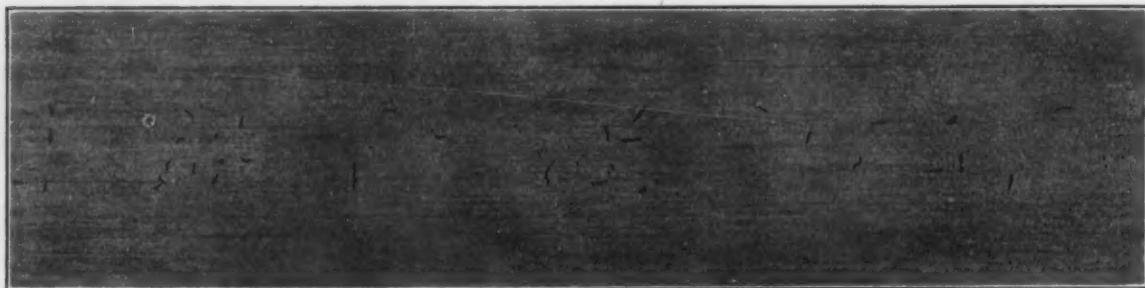


Fig. 3—Specimen from New 125-Lb. Rail. Reduction one-half.

Fig. 4—Specimen from New 130-Lb. Rail. Reduction one-half



A new rolled steel wheel which had cracked before being placed in service was cut up so as to obtain a tangential longitudinal slab from the center of the rim and when this was subjected to the hot deep etching solution, internal defects were found as shown in Fig. 7.

Summary

This investigation by means of deep etching with hot acid has developed the existence of interior defects in rail heads, which defects appear to be more frequent in rails that have developed a number of transverse fissures than in others which had only a few or no such fissures. They have also been found to exist in new rails which have not been in the track. It appears that these concealed defects cannot be detected by the usual methods of investigation and tests, or even by the usual method of etching.

Similar interior defects have been developed in a new tire and in a new rolled steel wheel.

Microscopical and chemical examination of the sections containing these defects have not, so far, developed the existence of any inclusions between the faces of the cracks and there is no apparent difference in the microstructure of the steel in these locations which would account for the action of the acid. After one of these cracks has been lightly developed and the surface polished and examined under the microscope the defect has been found to extend through the crystals, as well as following the boundary lines.

The manner in which the acid attacks these defects and rounds off the edges leads us to speak of them as cracks, but so far the investigation has not developed the cause. We are inclined to believe that the cause must be sought in the mill during some stage in the process of fabrication of the material.

Varying Opinions as to Causes of Defects

The discussion on the paper of Messrs. Waring and Hofamann was contributed to by representatives of steel producers, the railroads and others. The validity of deep etching results was questioned in one quarter. There were differences of opinion also on the question whether the defects shown went back to the ingot or had their initial causes in the operation of rolling or forging. There was a disposition on the part of mill representatives to consider that some of the deductions of the paper fell short of being conclusive.

Evidence of Transverse Fissures

James E. Howard, engineer-physicist of the Interstate Commerce Commission, in a written discussion which was read by the secretary, pointed out that the well known commercial process of pickling castings, forgings, rolled plates and drawn rods has also been employed as a laboratory method but without touching upon the vital features in the structure of the steel which Messrs. Waring and Hofamann had so well illustrated. It is important, he considered, to establish whether the cracks which made their appearance after pickling existed as cracks prior to pickling. There is evidence that they did.

Investigations are in progress, according to Mr. Howard, to determine the period with relation to temperature, when the shattering takes place. There are two basic questions—namely, the zone of temperature in which shattering occurs and the grade or grades of steel which are readily susceptible of such shattering. The appearance of some of the cracks suggests that they occur when the steel is at a fairly high temperature. It is probable that the shattering oc-

curs during the prevalence of conditions found in the latter stages of the rolling or forging operations, or soon after their completion. During cooling, internal strains are generally set up in cast, rolled and forged shapes. The peripheral metal is put temporarily into a state of tension, which changes to compression when the interior has cooled. This reversal of internal strains accounts for the introduction finally of a force of the kind required to rupture the interior metal. Mr. Howard suggested extending the experiments to the softer grades of rail steel, ascertaining the relative susceptibility of hard rails and soft rails in the display of shattered interiors. Passing to a discussion of transverse fissures, he considered that the authors had furnished evidence of the presence of numerous cracks, any one of which might be the starting point of a transverse fissure; others might lead to split heads in which the plane of rupture is longitudinal and vertical.

The Effect of Annealing

J. A. Capp raised the question whether in the case of fairly hard steels, such as those used by the authors,

the cracks may not have been due to the absorption by the steel of the hydrogen liberated at the surface of the steel by chemical action of the pickle bath, especially if the steel is in a highly strained state. Work done in the research laboratory of the General Electric Co. confirms this view, and it has been shown that annealed steel which is free from internal strain, is not ruptured by the internal gas pressure. Commenting on this latter observation, Mr. Waring, one of the authors of the paper, said that annealing had been resorted to in connection with the tests and that an annealed slab showed about as many cracks as slabs etched in the unannealed condition.

Deep Etching Magnifies Sponginess

Dr. J. S. Unger of the Carnegie Steel Co., Research Bureau, said that strong solvents cannot be recommended for etching as their action is so powerful as to tend to dissolve the entire specimen, and if sponginess exists they apparently increase it and do not differentiate between portions of slightly different solubilities. The Carnegie Steel Co. is conducting investigations to determine the rate of acid attack in the three dimensions of the rail, namely the transverse vertical from a disc section taken from the end of the rail, the transverse longitudinal taken from a disc section at the interior or under side of the longitudinal slab and the vertical longitudinal disc section taken from the interior of a longitudinal slab cut from the side of a rail. Experiments thus far show that the action of the acid is about four times as rapid in the transverse vertical disc as on either of the longitudinal specimens. The extent of any sponginess that may exist is therefore greatly magnified by deep etching, leading to erroneous conclusions as to the extent of the supposed defects.

The speaker referred to a railroad which purposely removed several good rails from track and cut them up for examination. Some were found to show supposed defects after etching, others were free from such defects. All showed longitudinal lines in the direction of rolling. Other rails which were defective were removed from the track, some of them having transverse fissures. These were etched and the showing was practically the same as in the etching from the good rails. Dr. Unger suggested that the only conclusive method would be to take a number of new rails and etch them, separate them into two classes, supposedly good and supposedly bad, and put these rails into the same service at the same time. From the average

track service it would be possible to determine which were good and which were bad.

Application to Gun Forgings

Major W. P. Barba contributed a brief written discussion referring to the work done by the Army ordnance office in 1917 and 1918 to determine the possible presence of fissures in gun forgings. Deep etching with quite strong sulphuric acid with some hydrochloric acid developed surely the locus of what later developed into fissures as well as "flakes." Later work was done at the Bureau of Standards to determine whether known small "flakes" or incipient fissures would "run" or develop as in a detailed fracture under repeated stressing within the elastic limit. It was found that they did so develop and appreciably. Apart from any methods for detecting such defects, the Ordnance Department has quite definitely concluded that for gun steel clean melting and ingot practice on well-known sound principles avoids practically all of the difficulty.

Defects Traceable to the Steel Mill

C. B. Bronson, of the New York Central Railroad, speaking of work in the laboratory of Dr. P. H. Dudley, said that the annealing of full sized rail-heads at 1000 deg. C. for four and one-half hours with furnace cooling following did not remove the condition for the development of cracks, for deep etching made on a half section of the rail-head disclosed cracks similar to those developed on adjacent unannealed samples from the same rail-head. Experiments have been made to locate the zones of metal which succumb to deep etching without the necessity of destroying the evidence contained in the material eaten out by the acids. Short pieces of rail-heads were taken and vertical half sections through the head were polished, then sprinkled with fine iron filings and magnetized. It was believed that the magnetizing would force the filings to arrange themselves in lines according to the location of the undeveloped cracks. Success in this line has been only partial thus far, but the work will be continued. Indications are that deep etching cracks in rail steel are in effect hot-short zones of metal which rupture when rolled below a proper temperature, then chill and embrittle further by rapid cooling on the hot beds combined with the shattering tendency of gagging.

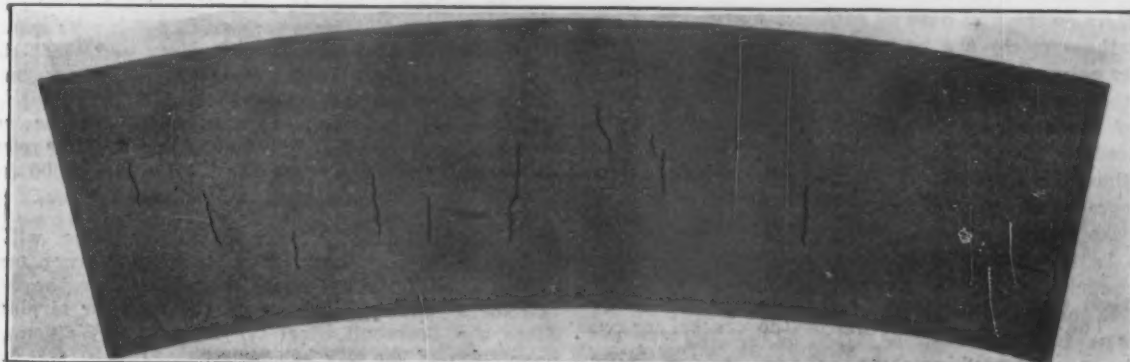
Defects from Rail Mill Practice

Max H. Wickhorst, engineer of tests for the rail committee of the American Railway Engineering Asso-



Fig. 5—Tangential Section from a New Tire. Reduction one-half

Fig. 6—Radial Longitudinal Section from a New Tire. Reduction one-half



ciation, said that while transverse fissures developed in service, he had found there is always a small granular spot from which the growth of the fissure in service had proceeded. The mystery has been as to the origin of the nucleus.

H. J. Force of the Lackawanna Railroad considered that the paper showed clearly that the defects are in the center of the rail and not on the side. His investigations had shown that where a rail is spongy and had developed transverse fissures the steel was not held long enough in the ladle. If the steel were held 9 to 10 minutes before pouring the rail would not show these fissures. He suggested an investigation based on the holding of the steel one and two minutes and then for longer times, up to 10 min. There was no question as to the steel held longer in the ladle making better rails.

Robert Job asked whether the authors of the paper had made any tests of new rails to find whether cracks developed in slow cooling or quick cooling steel, also whether heat treated rails had shown the same defects as they had brought out by deep etching. Mr. Waring replied that data thus far are not sufficient for answering these questions.

G. Aertsen of the Midvale Steel & Ordnance Co.,

referring to the last sentence of the paper, in which the authors say they "are inclined to believe that the cause must be sought in the metal during some stage in the process of fabrication of the material," raised the question whether deep etching and pickling did not produce defects in the metal which had not existed

before. He spoke also of the common experience of fish tails on material rolled on a bar mill, the outside of the piece being elongated more than the internal portion, which was at variance with the statement that the defects referred to in the paper do not appear on the outside or inside circumference of the metal. He cited the fact that in rolling tires the stretching

of internal metal is 20 per cent less than that of external metal. In his experience he had found that defects can be developed in sound steel by the method of rolling.

Oscar V. Cook of the Tennessee Coal, Iron & Railroad Co. called attention to the fact that in the pouring of steel from a 100-ton ladle 25 min. elapsed between the pouring of the first and the last ingots. The holding of the steel in the ladle, he argued, has not the effect that had been referred to by a previous speaker if it were true that the rails from a given heat were either all good or all bad.

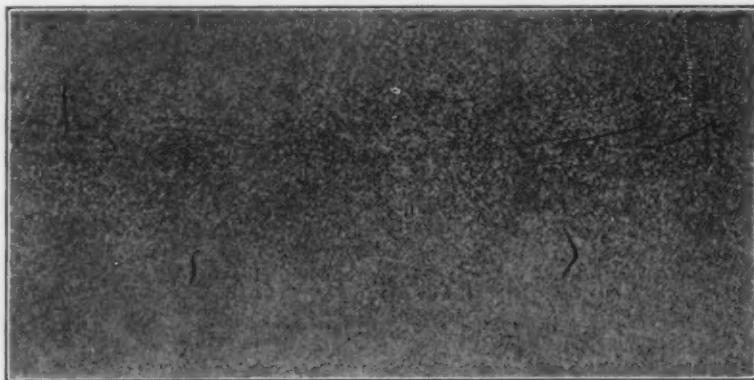


Fig. 7—Tangential Longitudinal Section from a New Rolled Steel Wheel. Reduction one-half

STEEL PRICES IN GERMANY

Costs Increase Rapidly Owing to High Wages and High Exchange Values

WASHINGTON, July 1—Increased prices of steel in Germany are reported in notes on industrial conditions in that country forwarded to the Department of Commerce from Stockholm. A summary as prepared by the Research Division of the Bureau of Foreign and Domestic Commerce says:

"The steel syndicate has announced the selling prices to be in force in May and June. The reasons given for the increases were higher wages, increased freight rates at home, and high exchange value of the Swedish crown, which increased the cost of imported iron ore. The prices were increased 100 marks for shapes, 115 marks for bar iron, rolled wire, and coarse plates, 125 marks for thin sheets, per metric ton in each case. The price of shapes, which, before the war, stood at 110 marks per ton and was only 220 marks at the end of 1918, was thus raised to 520 marks, for there have been three price increases in 1919, each of 100 marks a ton, going into force on the first days of January, March and May. Even these prices are to remain in force during two months only. The managers of the Laurahütte declare that their establishment was losing 230 marks on each ton of crude steel before the latest increase was introduced.

"Since the Government recently refused to approve the increase of about 50 per cent in the prices of coal and coke which the coal syndicate had announced for April 1, the pig-iron syndicate has likewise moderated its demands. A short time before, the syndicate had decided to increase the prices of pig iron by 107 to 147 marks per ton for the various sorts. As that increase was based on the expected increases in the price of fuel, it has

been reduced somewhat. The syndicate is satisfied with an increase of 52 to 90 marks per ton for pig iron. Hereafter hematite iron is to be quoted at 366.50 marks, and foundry iron No. 1 at 340 marks per ton. The coal producers are insisting, however, that they cannot continue mining unless the prices are increased considerably; so the situation appears rather dark."

German Steel and Pig-Iron Output in April

The German steel output for April is reported officially as having been 426,717 metric tons, which includes Luxemburg and Lorraine. This output added to the 574,191 tons in January, 529,913 tons in February, and 634,893 tons in March, brings the total to May 1, this year, to 2,165,714 tons. The low output in April was due to strikes.

The pig iron production in April was 434,328 tons, which contracts with 501,208 tons in January, 469,209 tons in February, and 545,939 tons in March. This brings the total to May 1 to 1,950,684 tons, or only a little more than the total for any one month in 1914.

Rate of British Pig-Iron and Steel Output

The British output of pig iron for the week ended May 3 was 151,000 gross tons from 290 blast furnaces. Of this 56,000 tons was hematite iron and 45,000 tons foundry and forge iron. For the five weeks ended May 3 the output was 754,000 tons.

The steel ingot and castings output for the week ended May 3 was 157,000 tons. For the five weeks ended with the same week the total was 774,000 tons.

A new hotel to be built in Warren, Ohio, will be called the Hotel Warner, after Jonathan Warner, president of the Trumbull Steel Co. Plans for the hotel call for a landing platform on the roof for airplanes. Since the Trumbull Steel Co. located in Warren, the population of the city has nearly doubled.

Manufacture of Modern High Speed Steel*

Use of Vanadium the Most Notable Change
in Recent Years—Steel Making Rather Than
Analysis Important—Use of Cobalt Lessening

BY JOHN A. MATHEWS

AFTER accepting the invitation to present a paper on the announced subject, the writer began to wonder just what the committee meant by "modern" high speed steel. A product that is of less than 20 years standing is certainly modern when compared with crucible tool steel which has been manufactured for about 170 years, and even the air-hardening steels which preceded high speed steel resulted from the investigations of R. F. Mushet about 50 years ago.

I have been deeply interested in everything pertaining to the history of the iron and steel business, but this latest product, high speed steel, seems to have sprung fairly fully developed from a variety of sources and at almost the same time, and I have been unable to show just when the change from the old type of air-hardening steels to the modern type of high speed steels took place. Obviously the change is associated with the announcement of the Taylor-White process; that is, the high heat treatment given these grades of steels as compared with the ordinary treatment of carbon tool steels. This process was announced at the close of the nineteenth century, and the results of the Taylor-White process were demonstrated on a large scale at the Paris Exposition in 1900.

An Evolution from Air-Hardening Steel

Notwithstanding the fact that the originators of this process took a special trouble to disclaim the invention of a steel, but only a process for treating steel, a large number of workers in steel still seem to feel that they were the inventors of the product known as high speed steel. Mr. Taylor, in his epoch-making paper on the "Art of Cutting Metals," very plainly states that this was not the case, and most users of steel have forgotten that the type of steel to which this treatment was first applied was the high-carbon air-hardening steel used prior to 1900.

The change from air-hardening to high speed steels was rather a matter of evolution than a distinct invention, and I have not been able to ascertain that the change was the result of any one man's discovery or invention. Chemically speaking, the change consisted in a very radical lowering of the carbon content and a great increase in the tungsten or molybdenum content. The chromium percentages have not been materially altered as compared with previously existing air-hardening steels; but high manganese, which was an important constituent of the original Mushet steel, is not now an important constituent in high speed steel; in fact, chromium replaced manganese in most of the air-hardening steels during the later years of their use in the 90s.

In 1901 the writer collected a number of the typical analyses of air or self-hardening steels from large users of these products. In 1902 our analyses showed that the change had already taken place in America, England and Germany, and the contrast is illustrated in Tables I and II. Each table contains products of the three countries mentioned, but the exact maker is not designated. The high carbon content and the low tungsten or molybdenum content in Table I indicates the character of air-hardening steels in use prior to 1901.

In Table II, although these analyses were made only one year later, it is seen that a change in character has come about, and relatively low carbon, with high tungsten or molybdenum, is the characteristic feature of the new steels. It will be noted that two of the

steels in Table II, one a molybdenum and the other a tungsten steel, contain no chromium.

Relying on Alloys for Hardness

It should be borne in mind that during the later days of air-hardening steels and the earlier days of high speed steels, it was a difficult matter to produce low carbons with the available ferroalloys. The introduction of electric furnace and aluminothermic alloys had much to do with the success of manufacturers in keeping their carbons down, but the idea that they should be reduced and that the alloys might be increased in conjunction with the application of a high heat treatment seems to have been almost spontaneous with the makers of tool steel in every country. In my search for the definite origin of this idea I learned of a user of steel who in the early days of the Taylor-White process obtained some extraordinary results with a particular bar of the old Sanderson self-hardening steel. Upon analysis it developed that this particular bar was considerably lower in carbon than usual, and instead of reporting this fact to the maker, he gave a sample of the steel to the representative of a foreign mill. My former associate at the Sanderson Works, Dr. E. L. French, is on record, however, as having predicted prior to 1900 that the tendency would be to rely for hardening upon tungsten and chromium rather than upon carbon in order to secure the kind of hardness which resists tempering—in other words, the peculiar red hardness upon which high speed steels depend.

It is probable that we shall never know who took the radical step and made the first low-carbon, high-tungsten high speed steel, but immediately following the announcement of the Taylor-White process there was great activity on the part of all tool steel makers in every country to produce a product which would yield maximum results when treated by this process. The courts decided that Messrs. Taylor and White did not make a patentable invention or discovery. A world jury, however, seemed to differ with this decision and every scientific honor was awarded them for their epoch-making announcement which revolutionized machine-shop operation and machine-tool building.

The Quality of "Red Hardness"

With the development of high speed steels, there has been much study devoted to them from many angles. The engineer, the machinist, the chemist and the metallurgist have all been interested, and much has been said and written in regard to this remarkable product. The question to be answered by all investigators of high speed steels has been: What constitutes the most efficient cutting tool and why? In Mr. Taylor's work, "The Art of Cutting Metals," the point of view of the machine shop economist is most ably presented. His work records the development of a high speed tool in regard to its composition, its heat treatment and the method used to secure the most economical removal of metal. The peculiar property of these steels in resisting softening in use Mr. Taylor has called the "quality of red hardness," and he makes no attempt to connect red hardness with any of the previously known physical properties of metal. The only method of measuring this quality of red hardness known to Mr. Taylor was the very expensive and time-consuming resort to cutting tests. The necessity for shorter and more easily applied tests was appreciated by Mr. Taylor, for he says, referring to cutting tests: "This test requires so much expensive apparatus, consumes so much time and is so slow, that a simpler

*A paper read at the meeting of the American Society of Testing Materials, Atlantic City, N. J., June 25, 1919. The author is president Halcob Steel Co., Syracuse, N. Y.

index or guide which will indicate correctly the quality of high speed tools is much needed. Moreover, we firmly believe that in time some simpler index to the property of red hardness in tools will be found."

Accepting this suggestion, many able scientists have conducted investigations upon the hardening and tempering qualities of high speed steels of many compositions, and also in connection with the study of the specific functions of the various elements entering into their composition. I might mention specifically the work of Dr. H. C. H. Carpenter upon the types of steel and critical ranges of heating and cooling of high speed

temperature at which hardness can be effected. He differs with the earlier conclusions of Dr. Carpenter that chromium does not confer the quality of air hardening in the absence of tungsten or molybdenum, but that chromium steel so hardened in air develops a comparatively slight degree of secondary hardening or "red hardness," as Taylor designated it.

Tungsten Confers "Red Hardness"

In regard to high tungsten steel in the absence of chromium, he finds that a large proportion of the tungsten remains undissolved even when the temperature is raised to the melting point, and agrees with Arnold and Read that this tungsten is probably in the form of a tungsten iron compound, Fe_2W . Very rapid quenching from high temperatures results in much less hardening than is obtained from a high chromium steel similarly treated; but the tungsten steel, on tempering, undergoes a very pronounced secondary hardening—in other words, it is the tungsten which confers the quality of red hardness. While Dr. Edwards, in his investigation, did not cover a study of molybdenum, we can say that molybdenum in its effects is very closely analogous to tungsten and about twice as efficient; that is, an amount of molybdenum confers a degree of red hardness similar to or greater than twice its weight of tungsten. The difference between these two metals seems to be one of degree rather than of kind. When chromium and tungsten are present together the presence of the chromium increases the solubility of the tungsten when raised to high temperatures. Dr. Edwards states that the maximum of resistance to tempering and the greatest degree of secondary or red hardness is obtained by getting the tungsten into complete solution, and in modern high speed steels he places this temperature at about 1350 deg. C. (2462 deg. Fahr.). In our experience this temperature is too high for practical results and is apt to result in brittleness, and also, as will be shown later, the hardness seems to decrease rather than increase upon extreme overheating to such a temperature, and at this temperature there is formed a so-called "brittle constituent," to which Dr. Edwards refers in his first paper. This constituent is due solely to overheating and is not produced when tempering at 700 deg. C. (1392 deg. Fahr.) in properly hardened high speed steel.

Dr. Edwards also points out very clearly, and shows by his results, that this secondary hardness by drawing the temper may be and usually is actually greater than the initial hardness of the hardened high speed before the temper has been drawn at all, but that at intermediate drawing temperatures there is some lowering of the hardness, which later increases as we approach the temperature at which full annealing begins. The temperature at which he finds the maximum secondary red hardness coincides almost exactly with the temperature given by Taylor as that recommended for the second heat treatment required in the Taylor-White process, for, as described by Mr. Taylor himself, the second heating of the hardened tool consists of heating the tools "(a) to a temperature below 671 deg. C. (1240 deg. Fahr.), preferably to 621 deg. C. (1150 deg. Fahr.) for about five minutes; (b) cooling to the temperature of the air either rapidly or slowly."

Magnetic Properties

As previously reported to this society, in a paper entitled "Magnetic Habits of Alloy Steels," the writer began some 15 years ago to study systematically and as a matter of routine the magnetic properties of practically all the alloy steels manufactured in our regular line of business. That paper did not touch upon any magnetic work in conjunction with air-hardening or high speed steels, but such work was commenced in the earliest days of the modern high speed steel, and renewed attention was given to this matter after the suggestion of Mr. Taylor that a simpler index or guide to the quality of high speed steels would be of great use and importance. A paper on the subject of the physical characteristics of high speed steel was promised for presentation at the last meeting of the International Association for Testing Materials held in New York in 1912. At that time the work was not suffi-

Table I.—Self-Hardening Steels, 1901

Maker No.	Carbon, Per Cent	Manganese, Per Cent	Chromium, Per Cent	Tungsten, Per Cent	Molybdenum, Per Cent
1	2.19	1.32	0.50	5.63	....
2	1.69	0.45	3.73	7.63	....
3	1.14	0.33	2.09	7.98	....
4	1.79	0.50	3.96	....	4.54
5	1.55	0.24	3.22	7.80	....
6	1.55	0.21	3.67	9.42	1.10
7	1.78	1.18	....	7.22	....
8	1.40	1.65	3.69	....	4.59
9	1.75	3.92	....	6.61	....

steels under varying thermal treatment, and also upon the tempering and cutting tests of high speed steels. The writer took a special interest in these investigations because of the fact that he had the pleasure of furnishing Dr. Carpenter many of the alloys used by him, taken from materials used in his early investigations in this country.

Effects of Chromium and Tungsten

It may be taken for granted that anyone interested in the scientific study of high speed steel will study Frederick W. Taylor's work upon the art of cutting metals. Dr. C. A. Edwards has studied the function of chromium and tungsten in high speed steels, and in conjunction with H. Kikkawa, published a later paper upon the effect of chromium and tungsten upon the hardening and tempering of high speed tool steel. Particular attention should also be given to the papers by Prof. J. O. Arnold and A. A. Read upon the chemical and mechanical relations of iron and carbon when associated with tungsten, molybdenum, chromium and vanadium. Each of these elements has been taken up one at a time in its relation with iron and carbon.

Dr. Carpenter, in studying the heating and cooling curves of tungsten and molybdenum products, finds the effect of these elements to be, first, the widening, splitting and lowering of the critical ranges by the special alloy elements; second, the complete suppression of the widened, split and lowered range by rapid quenching. He found also that these steels so hardened were in the austenitic condition and showed no signs of tempering when reheated below 500 deg. C. and in some cases to even higher temperatures. Carbon tool steels show the effects of tempering as low as 200 deg. C. Dr. Carpenter later supplemented this investigation with another one in which he studied the effect of etching reagents upon hardened and tempered high speed steels as prepared for microscopic examination. In general he found that the higher the steel had been heated for hardening, the less slowly it was attacked by the etching reagent. Also that when fully hardened and later subjected to tempering operations, the converse was true, namely, that the more fully the temper had been drawn the more easily it was attacked by the etching material.

Dr. Edwards, in his earlier paper, finds that hardness assists the efficiency of the cutting tool, referring to purely mineralogical hardness as distinguished from red hardness. He also states that chromium forms a double carbide with tungsten and a new brittle constituent appears at about 700 deg. C., in tempering which caused the failure of high speed tools. In his later statement, published jointly with Mr. Kikkawa, he abandons these last two positions but states that chromium in these steels in conjunction with carbon is the cause of the great hardness of high speed steels and that it produces a marked lowering in the tem-

ciently advanced to permit of presenting the results, and, in fact, even yet the results are not what we had hoped to obtain from this long continued study. It was thought that there might be found some critical temperatures in connection with the magnetic or electrical resistance of high speed steel which would furnish a definite indication of its properties at those temperatures most suitable for commercial hardening. In addition to magnetic and resistance tests of various high speed steels hardened and tempered in a wide variety of ways, we have supplemented the work with microscopic examinations, and to some extent by cutting tests.

While in the aggregate a great variety of high speed steel compositions have been tested, not only of our own regular and experimental steels, but also commercial steels of a great many brands foreign and domestic, the greater part of the systematic investigation was confined to four steels, the analyses of which are given in Table III. These steels cover quite a range as regards their chromium, tungsten and vanadium content. Steel No. 31 represents a type which was fairly generally used about 10 years ago; in fact various writers, as the result of practical tests, have contended that tungsten above 13 or 14 per cent is of no advantage. Practical experience, however, has led for the most part to higher tungsten percentages.

Steel No. 34 is introduced because it corresponds quite nearly with the analysis of steel to which Mr. Taylor referred as giving the best results obtained with any steel at the time he was actively engaged in this work. In fact, because of Mr. Taylor's recommendation, steel of this character was once adopted as the standard material desired by the Navy. Their specification, however, calling for high tungsten and high chromium, was abandoned after one year because it was found that steel of the type represented by No. 33 gave materially better results.

Steel No. 32 is intermediate in quality as compared with Nos. 31 and 33. As the result of a very exhaustive series of cutting tests made as nearly as possible in accordance with the methods outlined and recommended by Mr. Taylor, these four steels will rank about as follows, starting with No. 33 as 100 per cent efficient: Steel No. 34 would be represented by 70 per cent, No. 32 by 66 per cent and No. 31 by 45 per cent.

It is apparent, therefore, not only from the analysis but from the figures above, that the steels are typical of well-known commercial types of steels, and it therefore might be thought that their behavior electrically and magnetically, also as to hardness, would show marked differences, with possibly some differences in critical temperatures both in hardening and in drawing. However, this does not appear to be the case, but the following general conclusions can be stated in regard to all of them.

Detection of Overheating

Starting with hardening temperatures at 982 deg. C. (1800 deg. Fahr.) and carrying them up to 1315 deg. C. (2400 deg. Fahr.), it would be noted that the electrical resistance, the scleroscope hardness and the coercive force increase fairly uniformly with the hardening temperature up to about 1260 deg. C. (2300 deg. Fahr.). There is a slight tendency to show a reversal of these properties beyond this temperature. In other words, it would indicate that overheating had commenced. Magnetic induction and residual density, as the hardening temperature increases, are lowered.

If these steels hardened at proper temperatures to develop full austenitic structure are subjected to the temperature operation varying from room temperature up to 649 deg. C. (1200 deg. Fahr.), it is noted that there is a general falling off in the hardness, resistance and coercive force as the drawing temperature is increased. This is not quite in accord with statements that have been made that there is no effect in drawing the temper of high speed steel until the temperature of 500 deg. C. (932 deg. Fahr.) has been reached. It is true, however, that the effect upon these properties is only slightly influenced below this temperature, while the rate of change increases fairly rapidly at temperatures above 482 deg. C. (900 deg. Fahr.). There is no

indication, as regards magnetic properties, of anything corresponding to the secondary hardening referred to by Edwards, nor have we found it in connection with hardness tests made by the scleroscope. In cases where the Brinell method is used we found it very difficult to get constant results with materials so extremely hard, but with that method we have found an indication of rehardening, or secondary hardening at high drawing temperatures, the maximum usually being about 593 deg. C. (1100 deg. Fahr.). The lower the temperature at which the initial hardening is done the lower will be the temperature at which the rehardening occurs on tempering, and presumably the sooner a tool so treated would fail in severe cutting where the frictional temperature was high. When the temperature in cutting is not extremely high we cannot conclude that the steel would fail sooner than one with a higher rehardening temperature. In such cases, in my opinion, physical or mineralogical hardness plays an important part as distinguished from red hardness, but where the cutting conditions are severe it would appear logical that the higher the temperature of red hardening the longer the endurance of the tools.

The tests that we have made were for the most part made upon hot rolled 1 x 1/2-in. bars in just the condition that might have been used for cutting tests or for supplying to users. After all heat treatments, however, the surface was examined by file testing to see that no unreasonable decarbonization had taken place. There was, however, some slight decarbonization of surface in all cases, undoubtedly due to scale and oxidation. However, we wished to operate under conditions as nearly as possible those that would obtain in practical work in case it were found possible to make use of physical tests rather than cutting tests as a means of judging the relative merits of high speed steels. Of course for determining hardness it is necessary to remove, by grinding, sufficient material to get below any possible decarbonized or oxidized zone.

We are convinced that to make these tests with scientific accuracy would require conditions of heating and temperature control much more refined than are usually found in industrial plants and that it would be desirable to operate on round pieces which could readily be rough turned prior to any treatment and ground on centers after each treatment to insure making the test on perfectly sound material. This, in my judgment, removes such methods from the kind of tests that Mr. Taylor had in mind, as they introduce the same element of expense and require the expenditure of considerable time.

For purely scientific reasons it might be worth while to conduct such a series of tests on different types of high speed steel; the intervals of temperature should

Table II.—High Speed Steels, 1902

Maker No.	Carbon, Per Cent	Manganese, Per Cent	Chromium, Per Cent	Tungsten, Per Cent	Molybdenum, Per Cent
21	0.63	....	4.00	....	6.00
22	0.42	....	4.95	10.75	....
23	0.57	0.43	3.30	11.58	....
24	0.75	....	....	19.50	....
25	0.37	....	5.10	13.83	....
26	0.62	....	6.50	21.06	....
27	0.84	0.07	2.76	11.25	....
28	0.56	....	2.95	9.74	....
29	0.60	0.30	....	....	9.25

preferably be not over 10 deg. C. (50 deg. Fahr.) both in the tests made on hardened bars and also on the tempering ranges, particularly from, say, 482 deg. C. (900 deg. Fahr.) up to the point of softening. This is entirely too complicated and extensive a program to consider as a convenient substitute for the cutting tests.

Vanadium Marks an Epoch

To refer again to the title of the paper and what is meant by "modern," we might call attention to the difference in analyses displayed in Tables II and III. The most noteworthy change is in the introduction of vanadium, which is now used in practically every high speed steel; in fact, it is the only general addition that has been made to the earlier types which seems

to afford universal improvement in quality. The writer began experimenting with the use of vanadium in 1903, and it is well to bear in mind that at that time vanadium was almost a chemical curiosity. It was worth about \$15 a pound, and this was some time prior to the formation of the American Vanadium Co. which manufactured and sold vanadium in large quantities. So far as the writer is aware, the entire stock of ferro-vanadium in the country when these experiments were begun consisted of not over 100 lb. in the hands of two different dealers in New York. We purchased one-half of the entire stock of each dealer. As the result of

it is absent. These comments are made notwithstanding the fact that one of the most carefully conducted competitive tests on high speed steel ever made in an industrial plant was won by a steel containing cobalt, and it might be added that there is every probability that the same steel without the cobalt would have been equally successful.

The use of uranium has been advocated during the past few years, but it seems to be very difficult to handle owing to the ease with which it is oxidized, and so far as our experience goes we have been unable to see that it confers any specific benefit. Such steel as we have examined has been more apt to show seams and surface defects than steel in which it is absent, and the microstructure of the steel itself usually indicates the presence of considerable amounts of material that are suspected of being oxides of uranium. It should be noted that when oxide of uranium is formed in melting it has small chance of being eliminated in the slag owing to its great weight. It may be that with more experience means will be found of introducing this material into the bath without such great loss of expensive metal and without the formation of these impurities in the steel which cannot but prove detrimental.

Other elements have been tried, including cerium and zirconium, but no conclusions are available as yet.

Little Change Since Vanadium Came In

The term "modern" high speed steel therefore may be considered as referring to the product since the introduction of vanadium, as no generally accepted improvement has been made in high speed steel since that time. Improvements have resulted in the general quality of the material available, due to greater skill in manufacture, and to the availability of superior raw materials in the form of metals and ferroalloys than were obtainable in the early days of the industry.

It is still a constant source of surprise to see tests conducted in which a steel that may appear of inferior analysis proves successful, whereas some other type of analysis, judged from this viewpoint only, would naturally be expected to prove the better steel. In a very elaborate series of tests, including over 50 analyses, it was noted that in those steels included in the first group as to merit the compositions vary from 12.70 to 18.59 per cent of tungsten, from 1.70 to 5.58 per cent of chromium, from 0.40 to 1.73 per cent of vanadium, and from 0.52 to 0.81 per cent of carbon. The steels rated as second and third class in general covered almost identical ranges. It therefore seems that steel making rather than chemical analysis is the first consideration, and so far we are not able to define or to specify all the elements which enter in, from the melting to the finishing of a bar, to produce first-class material in a very wide range of analyses, and no physical or chemical test has been developed as yet which helps very much in determining the matter of quality.

Table III.—Analyses of Four Steels Used in Tests

Steel No.	Carbon, Per Cent	Silicon, Per Cent	Manganese, Per Cent	Chromium, Per Cent	Tungsten, Per Cent	Vanadium, Per Cent
31	0.63	0.19	0.26	4.21	13.10	0.25
32	0.61	0.19	0.36	3.34	16.28	0.40
33	0.63	0.27	0.31	12.99	16.87	0.85
34	0.64	0.22	0.24	3.35	18.99	0.15

these experiments carried on at the old Sanderson works, a patent was granted the writer, issued on Jan. 3, 1905. Other experimenters were doubtless working with the same thing, and in fact Mr. Gledhill referred to its use in 1904, as did also Mr. Taylor. In fact, the composition of tool steel previously referred to as giving Mr. Taylor his best results showed 0.3 per cent of vanadium. During the year 1905 the Rex AA steel was put upon the market, and other vanadium steels followed shortly, but it was not until three years later that certain foreign makers copied this original steel exactly and made great claims as to originality in regard to their product.

Cobalt Less Extensively Used

As has been stated, vanadium seems to have conferred general benefit upon all tungsten-chrome or molybdenum-chrome high speed steels. In this particular it differs from other additions that have been introduced since. The use of cobalt received considerable attention a few years ago, but it was noted that it was always present as an addition to types of steels that would have given remarkably good results if the cobalt had been omitted. I have never seen anything to indicate that it could be used as a substitute for any of the other elements regularly present, and its use is not now as extensive as it was a few years ago. As an element of increased cost it has not shown sufficient improvement in the long run to warrant its general use. So far as our observations are concerned it seems to lead to some uncertainty in the manufacture and treatment of the steel, and steels containing it seem to be more difficult to reforge or redress than steels in which

Discussion Emphasizes Cobalt—Some Cutting Tests

A number of excellent contributions were called out by Dr. Mathews's paper, including one from the Navy Department. These agree in the main with his views as to the epochal character of the introduction of vanadium and the lack of important developments since vanadium became a leading factor. There is some difference of opinion, however, as to uranium and cobalt, particularly the latter. The discussion on the paper, as given below, is a valuable addition to current knowledge of high-speed steel.

High Cobalt Content and High Drawing Temperatures

BY J. HEBER PARKER*

As regards the addition of vanadium to the earlier tungsten-chrome high speed steel, it is interesting to note that a vanadium content up to 2.50 per cent has been used very successfully in connection with a lowering of the tungsten content to approximately 12.50 per cent. The red-hard condition, following proper treatment, is increased and in certain types of work, not-

ably dry cutting, increased efficiency has been obtained. This has been demonstrated in the last three or four Navy tests, as compared with the steels of the No. 32 type given in Table III of the paper. In carrying the tungsten and vanadium contents still higher till we have a steel approximately

Carbon	0.60 per cent
Chromium	3.00 per cent
Tungsten	20.00 per cent
Vanadium	4.50 per cent

the peak of red-hardness has been passed to such an extent that a steel of this analysis will not harden, even when quenched in water from temperatures vary-

*Carpenter Steel Co., Reading, Pa.

ing from 2300 down to 1400 deg. Fahr. Just where the peak of this tungsten-vanadium combination is the speaker has not definitely determined.

Cobalt Replacing Iron

In regard to the use of cobalt, the speaker agrees with the author in a general way but with one reservation. The addition of cobalt up to 5 per cent, i. e., adding up to 5 per cent cobalt to the other elements regularly present in recognized high speed steels, has a neutral action. Extensive tests were carried out by the speaker several years ago in which three standard types of high speed steel were used, and to these standard analyses were added from 1 to 5 per cent of cobalt. Actual cutting tests were made in each case, and there was no difference in efficiency between steels of similar analysis, whether the cobalt was present or not. If, however, a considerable percentage of cobalt is added, not in a general way as an alloying element to affect the iron base, but rather replacing the iron and thereby having the cobalt iron base affecting the carbon, chromium, tungsten and vanadium usually present, a marked increase in cutting efficiency has been found. Cobalt is added to produce a base having approximately the formula Fe_2Co , and this in a general way corresponds to approximately 28 per cent of the whole alloy being cobalt. This is covered by a patent granted the speaker and B. H. DeLong, issued July 10, 1917.

High Drawing Temperatures

In regard to the author's discussion of high drawing temperatures and the secondary hardening resulting therefrom, it has been the speaker's experience that a true secondary hardening does not occur at high drawing temperatures, such as 1100 deg. Fahr. unless the high speed steel tool has been heated to a sufficiently high temperature in hardening. If we assume a correct hardening temperature of 2250 deg. Fahr. and harden a tool from this temperature or from a temperature a little higher, then secondary hardening will be accomplished by a high drawing temperature, at, say, approximately 1100 deg. Fahr. If, however, the tool is hardened from 2100 deg. Fahr. then the effect of drawing temperatures on high speed steels is more nearly like that of simple carbon steels, only, of course, higher drawing temperatures are required to produce similar results. In the speaker's experience with the hypothetical case under discussion, the tool hardened from 2100 deg. Fahr. will not do as good work as the tool hardened from 2250 deg. Fahr. regardless of the drawing temperature and regardless of the temperature of the tool at work, i. e., whether it is used dry or whether it is used wet with a large amount of cutting compound which keeps the cutting edge of the tool relatively cold. Makers of high speed tools as a class do not develop in the high speed steel tools all the potentialities that the steel possesses, because they are afraid of ruining the cutting edges of the tool by using the high temperatures necessary to secure proper initial hardening. To turn out formed tools with the proper initial hardness requires carefully regulated furnace conditions and a high degree of skill on the part of the tool hardener, but it can be and is being done.

Analysis Not Complete Guide

The speaker believes that the author's definition of the term "modern" high speed steel should be accepted as generally correct. It is interesting, however, to find a number of cases even today where some of the "older" high speed steel types work out to better advantage than the "modern" ones, i. e., those containing vanadium; but from the standpoint of red-hardness the "modern" are undoubtedly superior.

In conclusion, the speaker desires to concur with the author in that steel-making, rather than chemical analysis, is the first consideration. Some buyers of high speed steel insist on certain analysis, usually specifying a tungsten content only. The speaker does not believe that chemical specifications for high speed steels are of any avail to the consumer, for in high speed steel more than any other alloy steel with which

he is familiar, there are so very many points of merit not covered by the analysis.

Standardizing of Practice Important

BY EDWARD W. RETTEW*

There are at the present time a considerable number of high speed steels on the market for which phenomenal performance is claimed because of the presence therein of one or more of the elements uranium, cobalt, molybdenum. It is refreshing, indeed, to have a statement from one of recognized authority that no generally accepted improvement has been made in high speed steels since the introduction of vanadium some 14 or 15 years ago.

Knowing that the subject of high speed steel was to be presented at this meeting, the writer has made, during the past three months, a careful study of a considerable number of high speed steel analyses, representative of present American practice, from which he has prepared the following limits and desired analysis:

	Limits	Desired
Carbon	0.60 to 0.70	0.65
Manganese	0.15 to 0.40	0.30
Phosphorus	not over 0.015	under 0.010
Sulphur	not over 0.015	under 0.010
Silicon	not over 0.030	0.20
Chromium	3.50 to 4.50	4.00
Tungsten	16.00 to 18.00	17.00
Vanadium	0.65 to 1.05	0.85

My own experience has been that analysis of the same brand of steel is likely many times to be widely variant in different shipments. While the writer does not wish to have his attitude construed as being opposed to research involving heretofore untried or little used elements as additions to high speed steel melts, yet he firmly believes that if steel manufacturers and users will concentrate on the standardizing of raw materials, melting practice, forging and annealing processes and methods of treatment and grinding involved in the manufacture and use of a high speed steel which shall lie within the above limits, aiming to attain the desired analysis (which it will be noted, agrees very closely with steel No. 33 mentioned in Dr. Mathews's paper, except for the chromium content, which is slightly higher) the improvements likely to be attained will be truly remarkable.

Favorable Results from Cobalt

BY N. B. HOFFMAN†

Commenting on Dr. Mathews's very able paper, I would say I can agree with his version on the use of uranium in high speed steel, at least when 0.2 or 0.3 per cent of uranium is used to displace 10 to 12 per cent of tungsten and obtain the same efficiency from the steel. I have made numerous tests with uranium and from the results obtained fail to see where it has any virtue in a high speed steel, but I do not feel the same in reference to cobalt. Having made numerous tests on cobalt high speed steel during the past five years, and on competitive tests with various composition, with and without cobalt, I feel satisfied that it has a distinct advantage over non-cobalt steels when in the proper proportions, although I do not think it could be used as a substitute for any other elements regularly present.

I have tried out high speed with varying amounts of cobalt, from 0.5 to 6 per cent, and have found the best results were obtained with between 2 and 2.5 per cent; the higher and lower percentages of cobalt did not seem to improve the steel in the same degree.

Tools made from cobalt steel seem to produce the best results when heated to 2300 deg. Fahr. and cooled by an air blast, the temper being drawn after hardening to 850 deg. Fahr., while to get the best results from modern high speed, practically all manufacturers advise heating the tool to 2200 deg. Fahr. immersing in oil and then drawing temper to proper degree of hardness required for the purpose (from 400 deg. to

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850 deg. Fahr.). The following is an approximate analysis of the cobalt steel in question:

Carbon	0.70	per cent
Manganese	0.25	per cent
Phosphorus	0.014	per cent
Sulphur	0.016	per cent
Silicon	0.35	per cent
Tungsten	17.50	per cent
Chromium	3.75	per cent
Vanadium	1.30	per cent
Cobalt	2.50	per cent

Competitive tests have been made under the same conditions, with steels containing the above approximate analysis, with and without cobalt, and the cobalt has proven superior in every case. I have also tried nickel in place of cobalt and a tool with the following analysis was used:

Carbon	0.70	per cent
Manganese	0.28	per cent
Phosphorus	0.016	per cent
Sulphur	0.018	per cent
Silicon	0.38	per cent
Tungsten	18.18	per cent
Chromium	3.91	per cent
Vanadium	1.33	per cent
Nickel	1.73	per cent

Steels of this type did good work in ordinary shop practice, but when subjected to fast heavy work they were no better than standard high speed.

The cobalt steel does its best work when used as lathe, planer and boring tools, and when run at high speeds and on heavy cuts. I have no knowledge of the competitive test Dr. Mathews mentions in his paper, but I have many of my own and will review several of them.

Test No. 1 was run on locomotive driving wheels, 64 in. in diameter. The size of tool was 3 by 1½ in.; the speed was 18½ ft. per min.; the feed was ¾ in. and the cut ¾ to ½ in. Eleven tires were finished per grind of tool; the shop record was five tires per grind.

Test No. 2 was on shell turning, and the tests were run on twelve Le Blond lathes, operating continuously for from three to four weeks, working on forged 3-in. Russian and United States shells. The size of the tool was 1¼ by ¾ in.; the speed was 72 ft. per min.; the feed 1/16 in. and the depth of cut ⅛ in. The shells were 3 in. in diameter and 11½ in. long. The average results were 90 United States shells and 110 Russian shells per grind of tool.

I thoroughly agree with Dr. Mathews that steel making is the first requisite necessary in determining the quality of high speed steel, the manufacture of which, with its complex alloy composition is a task of no mean proportions, and calls for an experienced personnel in every step of its manufacture.

Results of Practice at Nicetown

BY DR. GEORGE L. KELLEY*

Dr. Mathews has clearly indicated the difficulties in the way of determining the best composition and treatment for high speed steel. All of us have made and treated certain compositions which in their performance in preliminary tests seemed likely to exceed our expectations, only to have them fail in the final tests. The performance of high speed tools is dependent upon so many factors that this is not altogether astonishing, yet in the last resort the value of the material is in proportion to its good behavior in the cutting test. Dr. Mathews will have made an extremely valuable contribution to the testing of high speed steels if his work on magnetic testing of these steels will permit us to predict the performance of a given steel. Its value will be even greater if it indicates why the tested specimen will succeed or fail. But such a test will not be generally accepted until a large amount of work by several investigators has definitely established the connection between the magnetic tests and the performance in the shops.

Cutting Tests Not Always Conclusive

The cutting test contains so many variables that great care must be taken that some of these, inadvertently introduced, do not lead to wrong impressions

concerning the performance of the tool. Uniformity of conditions in grinding the tools and operating the testing lathes are as important as the composition and treatment. On the other hand we must maintain a certain degree of correspondence with shop conditions, for the object is to determine the value of the material for shop use. The writer recalls one instance of a composition which under test unquestionably surpassed the next best composition, but when this was tested on general work in the shop it failed so completely that no large class of operations was found among many varieties where it could be used to advantage. This indicates the importance of closely copying the best of shop practices in a test, and of even actually testing the material in the shop before finally accepting the result of the quantitative lathe test. Such a test, of course, should include a series of compositions representing a range of carbon, with the other elements as nearly constant as practicable.

High Tungsten No Advantage

Leaving for the moment the question of the test and considering the question of composition, we again find a large amount of evidence which indicates the difficulty in the way of drawing dependable conclusions. Dr. Mathews has pointed out that the best and poorest tools often fail within the same ranges of composition. In general, the experience at Nicetown is in harmony with that which he has expressed. I might add that we hold a decidedly better opinion of cobalt high speed steels. As to tungsten, we have reached the conclusion that no advantage accrues from using a high content of tungsten. Fourteen per cent seems to us to give as good results as higher percentages. We have not tried cerium and zirconium in high speed steels, elements which Dr. Mathews mentions, but we have tried tantalum. From its position in the periodic table this might be expected to show effects similar to those of vanadium. Our experiments so far, however, have not shown any advantage to attend its use.

Sulphur is an element which Dr. Mathews left out of his discussion, and probably he would be willing to leave it out of the steel, too, if that might be brought about. According to Dr. Arnold, sulphur in quantities up to 0.10 per cent is not harmful. We made a series of experiments with the object of bringing out the effect of this element. Our conclusions were not in agreement with those of Dr. Arnold in that we did find the cutting power of the steel to be reduced by high sulphur. The effect, however, did not appear to be serious until the amount of sulphur exceeded 0.06 per cent.

The so-called sweating operation is undoubtedly one of the most important steps in producing a good cutting tool. We have conducted experiments in which tools were placed in a furnace at constant temperature for various lengths of time. As a result of these experiments it appeared that a temperature of 2350 deg. Fahr. for times under five minutes gave the best results, and that a temperature of 2300 deg. Fahr. gave excellent results when the times were longer, up to 30 minutes. Beyond 30 minutes there was a falling off in cutting efficiency. The difficulty of standardizing such treatment, involving as it does factors of heat conductivity, heat capacity and time is considerable. Small pieces of steel, which are placed entirely in the furnace and which can be allowed to reach the temperature of the furnace, can be controlled satisfactorily, but larger lathe tools, which are hardened only on the end, cannot be reliably heated either by immersing the tip of the tool in a salt bath or by inserting one end in a furnace. We have had some success in placing tools in a furnace considerably above the desired temperature and observing the temperature of the steel itself with an optical pyrometer. The difficulties in the way of reading such temperatures satisfactorily, and of determining what temperature allowance to make for differences in size, are great in experimental work, and almost insuperable in practical work.

Dr. Mathews quite properly reduces the problem to one of steel-making. Improvement in steel-making must begin with the raw material and continue through

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the melting and casting. Even here the care may not end, but must follow the material at every stage of its manufacture into the ground tool.

Comparison of a Cobalt-Chrome with a Tungsten Steel

Some facts regarding a tungstenless steel were contributed by Capt. W. J. Baxter, bureau of construction and repair, U. S. N., by permission of the Navy Department. It appears that Lieut. S. E. Woodworth, U. S. N., attached to the bureau of ordnance, Navy Department, obtained on a visit to the Darwin & Milner Tool Steel Mills in Sheffield, England, a quantity of a high-speed tool steel known as cobaltcrom. One sample gave an analysis as follows:

Chromium	13.57 per cent
Cobalt	3.66 per cent
Molybdenum	0.84 per cent
Carbon	1.48 per cent
Silicon	0.80 per cent
Manganese	0.19 per cent

This was obtained in the form of a $\frac{3}{8}$ -in. octagon forged bar, and with another sample, this $\frac{1}{4}$ -in. thick and 4 in. in diameter, a casting milling cutter, were tested by Dr. William Campbell, consulting metallurgist of the Brooklyn Navy Yard.

The microstructure of the forged metal showed carbide in irregular patches and globules surrounded by pearlite. The carbide is somewhat segregated and follows the outline of the original dendrites which are more or less drawn out by the forging. Above 850 deg. C. the structure of the oil-quenched and air-cooled samples is practically the same and consists of martensite of very fine texture containing tiny patches of carbide, generally with a dendritic arrangement, that is to say, the aggregation of carbide forms the matrix to the dendrites of martensites. The structure is practically the same after the maximum temperature of quenching.

The structure of the metal as cast is finely dendritic. The size of the dendrites varies with the thickness of the specimen. These dendrites are surrounded by a matrix of the carbide eutectic. Some of them are undoubtedly pearlitic, while some may be martensite because the metal is comparatively hard to cut with a saw.

A Hack Saw Comparison

A hack saw blade was made of the cobaltcrom, 12 x $\frac{1}{2}$ x 0.032 in., with 14 teeth per inch. Cutting tests were made in comparison with a tungsten Star hack saw blade of similar size, tooth construction, etc. Each of the blades was operated under the same speed and pressure, the latter 20 $\frac{1}{2}$ lb., and 35 cuts taken with each. A Milford power hack saw machine with a $\frac{5}{8}$ -in. stroke was used. Cuts were made through a $1\frac{1}{4}$ -in. round soft machine steel. The cobaltcrom blade proved superior. The number of strokes necessary to cut through the steel was 237 to 270 with cobaltcrom and 326 to 563 with the tungsten.

Experiments in heat treatment indicated that the initial hardness of cobaltcrom as determined at ordinary temperature, 25 deg. C., increases with the hardening temperature from 930 deg. to 990 deg. C., then remains fairly constant up to 1040 deg., after which it drops abruptly with further temperature increments. The results furthermore indicated that cobaltcrom possesses the property of resisting loss of hardness by tempering, namely, red hardness, and that that property increases with the hardening temperature—which is a well known phenomenon exhibited by high-speed steels. Parallel tests on Rex AA tungsten steel indicated that the highest quenching temperature, 1290 deg. C., probably represents the best hardening temperature, while for cobaltcrom steel a temperature between 1030 and 1040 deg. is probably the best.

Lathe Tool Cutting Tests

Cutting tests of lathe tools were also made. Two of cobaltcrom and one of Rex AA steel, all $\frac{5}{8}$ in. square, were rough ground to the same shape, heat treated and then ground to the same shape on a universal grinder. The angle of the cutting face with its axis was 39 deg.;

its clearance was $9\frac{1}{2}$ deg.; its back slope was 16 deg. and side slope 18 deg. The nose was rounded on a $1/16$ -in. radius. The composition of the Rex tool was: C., 1.03 per cent; Cr., 3.31; W., 17.6; V., 0.28. The composition of the material cut was: C., 0.66; Mn., 0.50; Si., 0.46. Under constant conditions of depth of cut, feed and time, the tungsten steel was superior.

Comparative cutter tests were made at the Washington Navy Yard with two cobaltcrom and two tungsten high-speed steel cutters. The tungsten cutters were made from $3\frac{1}{2}$ -in. bar stock. The material was heated to about 2550 deg. F. and forged to improve the grain. One, T, was heated to 1230 deg. to 1260 deg. C. and cooled in air, and the other, T¹, to 1230 to 1260 deg. C. and then quenched in a mixture of two parts cylinder and five parts paraffin oil and then drawn in sperm oil at 288 deg. C.

One of the cobaltcrom cutters, C, was heated to 1030 deg. C., cooled in air for 1 min. and then quenched in oil; the other, C¹, was annealed by heating to 1000 deg. C. and cooled slowly in the furnace and then hardened by heating slowly to 1000 deg. C., remaining in the furnace until the temperature dropped to 970 deg. C., then cooled in air and quenched in oil when the red color disappeared in subdued daylight.

The chemical characteristics of the cutters were as follows:

	Cobaltcrom	Tungsten
Carbon	1.50	0.71
Cobalt	3.50	....
Chromium	13 to 14	4.23
Manganese	0.2	0.38
Phosphorus .....	....	0.012
Silicon	0.75	0.23
Sulphur .....	....	0.017
Tungsten .....	....	17.24
Vanadium .....	....	....
Molybdenum	0.75	....

All four cutters were ground to the same size, 4 in. in diameter, 0.234 in. thick and with 20 teeth. The tool hardness is here shown:

	Brinell Hardness Number	Scleroscope Hardness, Universal Hammer	Ratio, Brinell to Scleroscope
Cobaltcrom C	689	89.6	7.69
Cobaltcrom C ¹	671	87.6	7.67
Tungsten T	664	86.6	7.67
Tungsten T ¹	658	86.2	7.64

Tungsten Tools Excel for Output

The cutter tests were made on a No. 2 Brown & Sharpe belt-driven milling machine. Two cutters were mounted on the arbor to take cuts about $1\frac{1}{4}$ in. apart from a piece of nickel steel about 20 in. long, which had been forged and heat treated to secure uniformity throughout. After making eight cuts, the cutters were adjusted to a new position, the grooves never being allowed to exceed 0.8 in. in depth. Cutting speed was varied from 114 ft. per min. peripheral to 330 ft. and the feed from 8 in. to 21 in. per min. The results covering 50 to 70 runs showed that both the cobaltcrom and tungsten cutters made an unusually good record compared with current experience with best grades of high-speed tool steel. The results seemed to indicate that when production is of secondary importance in comparison with precision, cobaltcrom tools compare favorably with tungsten tools, but where the main purpose is to secure production, tungsten tools are preferable.

Dr. Mathews, who was unable to be present to read his paper, said in a telegram to the president that recent work with ferrouanium had given better results than were indicated in his paper and that proper reference to these results would be made in a revision of the paper.

In oral discussion following the reading of the written contributions given above, the point was brought out that in connection with heat treatment of high speed steel, if the steel stays in long enough to cause sweating, the condition of the surface would prevent good results with threading tools. It was pointed out that the manufacturer of threading tools needs to know whether the steel furnished him can be given full heat of 2300 deg. without getting the rough surface which would spoil the steel for chasers. In the case of lathe tools, if there is this rough surface from sweating it can be ground off.

Heavy Duty Milling Machine

The heavy duty horizontal milling machine illustrated is a new development of the Newton Machine Tool Works, Twenty-third and Vine Streets, Philadelphia, and is particularly designed for the heavy feeds required in railroad and locomotive shops. The table is supported its full length, and the machine has the required width, it is stated, to mill the heaviest of locomotive rods, two at one time.

The spindle is of taper end construction for taking up wear and maintaining alignment, and is provided with an internal taper hole. It has a through hole for the arbor retaining bolt and is arranged to drive the cutter arbor by means of a broad-faced keyway.

The table has four changes of gear feed, which is operated by rack and spiral pinion from a box in which are mounted adjustable sleeves, giving the changes without removal of the gears. The table has rapid traverse in both directions, and an adjustable automatic stop. The rapid traverse and feed clutch are interlocked so that they cannot be engaged simultaneously. The table has five tee slots planed from the solid, with drill stop pin holes at each end.

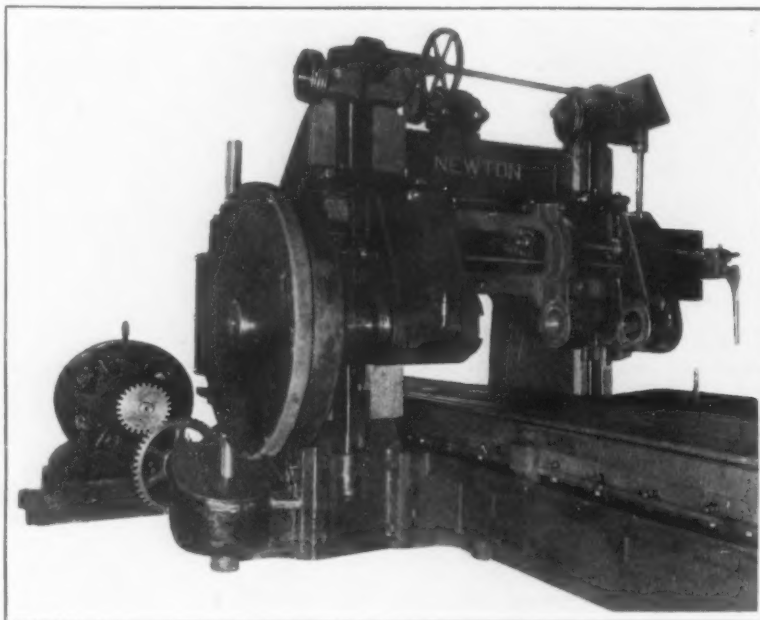
The cross rail is of the straight-faced type which provides 10 in. of side adjustment to the spindle by a screw from the right-hand end of the machine. The cross rail is supplied with one outboard bearing, and one intermediate bearing. The intermediate bearing provides for quick removal with the arbor. The cross rail is counterweighted and has power rapid traverse in both directions by a separate motor through double lifting screws. Hand adjustment is made to the cross rail from the end of the rail. There is a boss on the bottom of the cross rail, right-hand side, which, in connection with a gage stop on the upright, is used for gaging heights.

The bearings for the driving worm and driving worm wheel are cast integral with the cross rail, and have sliding sleeves for the spindle. The cross rail is gibbed to the main or wide upright only, with narrow guide construction for maintaining alignment, and is fitted with a continuous steel taper shoe for taking up wear. The cross rail is carried on two lifting screws held in tension at both ends to prevent buckling.

The spindle is driven by wheel and worm, having roller end thrust bearings, all of which are encased to run in oil. The driving worm shaft is double splined and the bearings in the worm box are protected by sleeves which are keyed to the driving shaft, both rotating in bronze bushings, so that the keyways do not come in contact with the bearings. The spindle head and outboard bearing are supplied with an additional surface bearing on the center line to take the thrust of the cut.

All gears are enclosed for complete protection of the operator. Counterweight ropes are of such length as to allow the weights to operate in a pit.

Two motors are required, one of 75 hp. for driving the cutters and also for operating the feed and rapid traverse motions to the carriage, the other of 5 hp., for operating the cross rail lift.



Horizontal Milling Machine Designed to Mill Two Heavy Locomotive Rods at One Time. The width between the uprights is 51 in., and length of table to mill, 29 ft.

Proposed Bureau of Manufactures

WASHINGTON, July 1—What can the Government do to encourage and stimulate the manufacture of our own raw materials into finished products? This is the question raised by Senator Sheppard of Texas. He has introduced a resolution in the Senate under which the committee on manufactures is directed to study the feasibility of establishing a bureau of manufactures as a permanent governmental agency.

Senator Sheppard calls attention to the need in this direction. He notes that while agriculture, commerce and labor are cared for by extensive departments of the Government there is no branch which attempts in a comprehensive manner to exercise the same functions with respect to manufactures.

Conversion of a large quantity of raw materials obtained in this country into finished products is the end sought. With proper stimulus, Senator Sheppard believes there no longer would be a feeling of "national shame" because "we ship enormous quantities of our basic raw materials abroad to be made by foreign countries into finished products and resold by them to us at a great profit."

Government Positions Open

Vacant positions at the United States Naval Ordnance plant, South Charleston, W. Va., include the following:

Superintendent of melt shops, requiring experience on open-hearth and electric melting furnaces.

Superintendent of forge shops, requiring experience in the forging of small guns, large caliber projectiles, large caliber guns, and forging and bending of armor plate.

Superintendent of heat treatment departments, covering the treatment of small guns, large caliber projectiles, large caliber guns and armor plate.

The following positions will be required to be filled in the near future in capacity of foremen: Open-hearth foreman, electric melt shop foreman, foreman of forging large caliber guns and armor plate, also to bend armor plate on a 14,000-ton hydraulic press, foreman to treat small guns, foreman to treat projectiles, foreman to treat large caliber guns, foreman to treat armor plate.

Candidates interested in applying for these positions may procure civil service application blank by communicating directly with the Steel Superintendent, U. S. Naval Ordnance Plant, South Charleston, W. Va.

The recently organized York Steel Corporation, York, Pa., has purchased an eighty-acre tract of land just outside of the city on which it will erect a plant for the manufacture of sheet steel, to be supplied to the York Corrugating Co.

The Bourne-Fuller Co., Cleveland, jobber in iron and steel, will enlarge its warehouse by the erection of a one-story structure, 136 x 330 ft. Two cranes will be installed.

Heat Treatment of Railroad Materials*

Present Practice on Manganese and Carbon Rails—Alloy and Carbon Axles—Solid Steel Wheels and Tires

BY C. B. BRONSON

THE rapid advancement made in the science of heat treatment of steel during the war and subsequent thereto is of especial interest to railroad officials, engineers and investigators. The knowledge gained recently in this will be valuable to metallurgists and engineers in the design, specification and treatment of steel for superior service. Railroad people must search constantly for the highest grade of steel to meet the increasing demands of traffic and operation, which necessitates larger structures, larger power units, and high speeds.

The fundamental basis for successful heat treatment is sound steel. This implies not only structural soundness and freedom from blow holes, pipes and inclusions, but chemical and physical homogeneity as well. This seems axiomatic, yet a number of violations are frequently encountered, when investigations are made of service failures. Heat treatment of unsound steel probably does more harm than good for even the best steel is put to a severe test during the quenching operation, while unsound or segregated metal may be easily fractured or weakened. There has been much discussion recently on the notch effect in rotating shafts and other parts which brings out the fact that internal or external defects are in effect notches or potential sources of failure and may develop into such after a relatively short period of service. The question of soundness in steel can not be too strongly emphasized.

Heat Treatment of Rails

Of the great number of steel materials used on railroads, perhaps none has been more widely discussed than the railroad rail. The development of the rail section is an intensely interesting story of evolution and improvement, and it is therefore only natural that many researches have been conducted to improve its quality by heat treatment. Most of the work attempted has been experimental in nature on short length pieces and not on full length rails. Many influences have retarded development of the latter, chief of which is the outlay and expenditure required to produce large tonnages, especially when it is recalled that present rail mills produce from 1000 to 3000 tons of untreated rails daily. Furthermore, there is the question of higher cost, as well as the relative efficiency and reliability of treated vs. untreated rails.

Probably for general service requirements, where properly designed sections are used, it will be a long time before the present efficient plain carbon basic open-hearth steel rails will be replaced as standard for most of the roads in this country. The basic open-hearth rail, under our present elongation and exhausted ductility tests, making it possible to obtain nearly all the ductility due to the chemical composition, is a wonderfully efficient product with a low rate of failure, and moderate rate of wear, other views to the contrary notwithstanding. To meet increased traffic requirements, the tendency on most roads is to go to a larger and stiffer section rather than specify heat-treated rails of lesser weight.

Effect on Air Blast on Mayari Rails

The simplest process for heat treatment of rail steel is the air-cooling method introduced by one manufacturer. This consists of an air blast blown from numerous small openings in a straight pipe and directed against the top surface of the rail head, the blast being maintained for about 2 min., after which the rail

is allowed to anneal in air. The head surface metal becomes sorbitic for a depth of about 1 in. and shows a Brinell hardness of 300 to 350, an elastic limit of 90,000 lb. per sq. in., a tensile strength of 140,000 lb. per sq. in., and 8 per cent elongation. The balance of the head metal is pearlitic in structure with a Brinell hardness of 240; elastic limit, 60,000 lb., and tensile strength, 125,000 lb. per sq. in., and an elongation of 10 per cent. The carbon runs from 0.50 to 0.65 per cent in this steel which is made from Mayari ores.

Oil and Water Treatment

A number of patents have been issued to one company covering a combined oil and water treatment. The treatment consists in passing the finished hot rails, head down, into a series of quenching vats, so constructed and regulated that the head only is treated in the first oil bath; passing them to the second vat where the head is immersed in water and the web in oil. In the third vat, both head and web are in water, which completes the treatment. One modification of the process provides a spray to force the water against the rail head instead of merely drawing it through the bath. A troostitic structure is obtained on three sides of the head, which tapers off into martensite for the balance of the head section.

Drop and hammer tests on rails so treated indicate great toughness and the ability to withstand severe shocks without failure. The composition and physical properties obtained after treatment are about as follows:

	Per cent	
Carbon	0.40	Elastic limit, 120,000 lb. per sq. in.
Manganese	0.50	Tensile strength, 190,000 lb. per sq. in.
Silicon	0.25	Elongation in 2 in., 11 per cent.
Sulphur, max.	0.04	Red. of area, 30 per cent.
Phosphorus, max.	0.04	Brinell, head, 420.
		Brinell, web and flange, 200.

One manufacturer found it necessary to redesign the standard section to successfully heat treat rails made of Mayari steel. A section, similar to the present B type, 100-lb. rail, was used as a basis, and to this was added 21 lb. by providing very generous fillets between head, web and base, and also increasing the thickness of the latter. The mechanical properties were apparently not given precedence in the design as they are low for this weight of rail. The design was adopted to obtain uniform physical properties, provide relief and reduction of cooling stresses, and to utilize a set of rolls which were on hand.

The treatment used was experimental, and therefore the details are not generally known. The composition and physical properties obtained after treatment were as follows:

	Per cent	
Carbon	0.33	Elastic limit, 115,000 lb. per sq. in.
Manganese	0.33	Tensile strength, 140,000 lb. per sq. in.
Nickel	1.30	Elongation in 2 in., 8 per cent.
Chromium	0.50	Red. of area, 1' per cent.

Under the drop the test pieces withstood from 6 to 12 blows before fracture when a 2000-lb. tup was dropped 25 ft. with supports 3 ft. apart.

One or two of the Eastern roads, with very heavy traffic conditions to meet, secured several of these rails, and will probably be in position in the very near future to report upon the success of the experiment.

Heat-Treated Manganese Rails

The only alloy heat-treated rails which have been made and purchased in large numbers are manganese steel rails. Those of early manufacture developed breakages with great frequency, but this difficulty has

*From a paper presented at the June meeting of the New York Chapter, American Steel Treating Society. The author is metallurgist, chief engineer's office, New York Central Railroad, New York.

since been overcome, as a number of changes in manufacture were introduced.

We purchased several hundred tons of these rails four years ago, and since that time they have carried over 100,000,000 tons of traffic without one failure, and at a remarkably low rate of wear—an exceptionally good record. From present indications they should outlast plain carbon steel rails in the ratio of at least 10 to 1.

The wonderful toughness inherent in manganese steel makes its use particularly inviting for rails on curves. Our present practice is to place them on the high side of curves with plain carbon rails opposite—generally reversed curve worn high rails which make the best combination. The susceptibility to flow prohibits their use on the low side of curves, especially where the tendency to widen and flatten under the wheels present improper contour is very great.

The 6-in., 105-lb. Dudley type rail is the only one we have had rolled in manganese steel. This is a broad head, stiff section, possessing high mechanical properties which are necessary when using metal with such low elastic limits. Any road contemplating the purchase of manganese rails is advised against ordering them rolled in light sections, for the combination of the low elastic limit and deficient mechanical properties make it easy for them to acquire permanent sets in service, creating a rough riding track which may eventually be the cause of derailments. We have learned from experience that manganese rails injured by truck derailments, due however to causes other than roughness of track, are badly bent out of shape, although they remain unbroken. It was found necessary to scrap the rails, as the trackmen could not straighten them by any method tried.

Manufacture of Manganese Rails

The manufacture of manganese rails calls for several departures from the ordinary practice in the mill. Hot tops must be placed on the ingot molds to reduce the pipe and fill the cavity due to shrinkage; great care is required in heating and soaking the ingots in the pits for proper rolling. The rails are rolled in the usual manner and, after sawing, are quenched at 1050 deg. C. by plunging immediately into a cold water bath, then drawn through the same by means of dogs on endless chains. The quenching, as is well known, is necessary for the purpose of suppressing the transformation range, and to retain the structure in the austenitic condition, otherwise the rails would be as brittle as glass.

The composition called for in making rail steel is as follows:

	Per cent		Per cent
Carbon	1.00 to 1.35	Phosphorus	Max 0.10
Manganese	10.50 to 15.00	Sulphur	Not specified

Tests for physical properties are made by the usual drop test: The toughness and tenacity of the material being so great that several blows of the 2000-lb. tup falling 20 ft. are required to exhaust the ductility, which frequently runs as high as 25 per cent to 30 per cent per inch.

We also make a load deflection test upon a full length rail supported at the ends and loaded by means of a scale pan at the center. Elastic limits found in this manner are close to 35,000 lb. per sq. in., which is a more reliable index than can be secured from tensile test specimens burned out of the rail section and ground to size. The results are always high by the latter method, and therefore not used.

The return of normal conditions should see an increasing amount of manganese steel rails placed in service, for there is no question about their superiority for overcoming curve wear which our present rails now succumb to quickly.

It is well to mention in passing the successful use of manganese steel for frogs, crossings and switch point tips. Their resistance to wear is similar to that of manganese rails, and they are used quite extensively. The tendency to breakage, however, is somewhat greater in the cast steel parts than for rolled rails.

Two heat-treated track materials purchased in large quantities are rail splice bars and track bolts. Splice

bars are made to the following chemical and physical requirements:

	Per cent	
Carbon	0.45 to 0.55	Elastic limit, 65,000 to 72,000 lb. per sq. in.
Manganese	0.30 to 0.50	Elongation in 2 in., min., 12 per cent.
Phosphorus	max... 0.04	

Heat-treating Splice Bars and Track Bolts

In manufacture the bars are sheared to length, reheated to about 800 deg. C., hot punched and quenched at 700 deg. C. or over, then subsequently reheated or withdrawn from the oil bath for tempering. The high elastic limits obtained place them on the same level as rail steel so far as physical strength is concerned and increases their resistance against permanent sets and sagging at the joints.

Track bolts when heat treated show elastic limits of 70,000 lb. per sq. in. and over when made of 0.30 per cent carbon steel and over. These high limits provide additional strength against stretching when tightened with the trackman's wrench and becoming loose due to the transmission of stress at the rail ends and the impacts from wheel loads.

The usual process for heat treating consists in rolling the threads hot, then allowing the bolts to drop into a bath of oil, and finally discharged into a hopper from an endless chain. Heat-treated bolts are in extensive use and giving satisfactory service.

Heat-Treated Driving Axle

Of the large number of steel materials purchased for motive power and rolling stock, the heat-treated driving axle is in many respects the most important. The complex stress action under which driving axles operate is about as severe as can be found in any service. Besides sustaining direct heavy loads, they must also absorb the combined shearing, rotative, torsional and oscillating stresses, both generated and transmitted, through the various parts of the running gear and tractive mechanism. There is also the possibility of overheating due to lack of lubrication and excessive surface friction on the journal bearing. Only the highest grade material should be used for service of this character.

Axles, 9 in. in diameter and over, are generally hollow bored before treatment. The size of the hole varies, but is usually 3 in. for a 12-in. diameter axle. The principal benefit gained from removal of this central core is in reducing the wall thickness through which the quenching medium must penetrate, also in accelerating the dissipation of the heat and securing greater uniformity of physical properties throughout the large mass of metal. Other advantages are claimed for hollow boring, such as removal of the segregate but examination of a number of axle failures shows this not always to be the case.

A number of precautions are necessary to insure the steel against faulty treatment. The temperature must be carefully regulated, a uniform temperature secured throughout the axle and the quenching must be accomplished with the least amount of injurious internal stress in the large volume and section. Axles are usually quenched vertically and the bath agitated for proper circulation.

Some idea of the severity of the quenching operation can be gained when it is stated that calculations indicate that 225,000,000 ft. lb. of converted heat units or energy must be diffused from a 10-in. diameter axle, and furthermore this must take place in a very short space of time. It is therefore necessary to insist on careful observation of the various steps in manufacture as well as in quenching to insure against cracks and breakages.

Alloy Axles

Both chrome-vanadium and plain carbon steel driving axles are purchased to specifications calling for heat treatment. For the former, the quenching is usually done around 900 deg. C., and the draw back made at about 670 deg. C. The composition and physical re-

quirements for chrome-vanadium steel conform to the following:

	Per cent	
Carbon	0.30 to 0.40	Elastic limit, min., 80,000 lb. per sq. in.
Manganese	0.35 to 0.65	Tensile strength, 90,000-125,000 lb. per sq. in.
Phosphorus, max.....	0.04	Elongation in 2 in., not under 20 per cent.
Sulphur, max.....	0.04	Red. of area, not under 50 per cent.
Silicon, max.....	0.20	
Chromium	0.75 to 1.25	
Vanadium.....	Not under 0.15.	

For plain carbon steel axles the following limits are generally specified:

	Per cent	
Carbon.....	Not over 0.60	Elastic limit, min., 50,000 lb. per sq. in.
Manganese.....	0.40 to 0.80	Tensile strength, min., 85,000 lb. per sq. in.
Phosphorus....	Not over 0.04	Elongation in 2 in., 22 per cent.
Sulphur.....	Not over 0.04	Red. of area, 45 per cent.

A proof test is also required of each axle before acceptance. Some axles of chrome-vanadium steel have developed cracks or checks in the journal surfaces and in some cases flat slabs or flakes, with curved ends, $\frac{1}{2}$ in. thick by 2 in. or less in width and length have been removed from the journal by peining and sawing partly through, then chiselling out the piece. Defects of this nature have been developed in some axles only after they had covered over 500,000 miles. These are probably resultant effects of quenching, brought out eventually by fatigue action of long service.

Treatment of Pins and Rods

Crankpins, straps, piston, side and main rods are heat treated for use on certain classes of power and types of service. The treatment and composition specified is much like that for axle steel. Crank pins of the larger sizes are hollow bored in the same manner as driving axles.

The advantage of heat-treated reciprocating and oscillating locomotive parts is in the lessened weight of the same and the added strength obtained. A reduction in weight of counterbalances is thereby effected, which reduces the stresses imparted to the rail section as well as equalizing the applied stresses for all points of the driving wheel circumference. Heat-treated locomotive parts are coming more generally into use as larger power units are installed for heavy-duty service.

Treating Solid Steel Wheels and Tires

Solid steel wheels and tires have received a great deal of attention from both manufacturers and railroad interests to secure improvement by heat treatment. Some experiments conducted have proven successful; others failures from many causes, among which are: Abnormal number of breakages and failures; development of hair cracks; shelling, and low mileage obtained for the cost. The reasons for resorting to heat treatment are principally to decrease the rate of wear of flange and tread, to obtain greater mileage between turnings, and to increase the fatigue resistance of the tread. Successful service depends upon many different factors, such as load carried per wheel or tire, type of service, braking conditions, speed, etc.

Among the variety of treatments attempted, one company toughened both inner bore and outer rim section by heating the wheels to around 800 deg. C., then treating by means of a revolving water spray playing against the bore and tread. After tempering, a Brinell hardness of 300 to 350 was obtained on the tread with a 0.70 per cent carbon steel.

The Davis Manganese Wheel

Several thousand cast steel wheels have been produced by one manufacturer, with a very tough, slow wearing tread, obtained when powdered ferromanganese was added to the stream of metal when poured into the wheel mold, which is then revolved during casting, forcing the added manganese towards the outer rim so that the manganese is about 1.80 per cent in the tread, tapering off to 0.65-0.75 per cent in the plate. The carbon runs close to 0.30 per cent. After annealing, the

wheel treads are toughened by a water-treating process. The manufacturer produces a one-wear wheel from this novel practice with the advantage of the cast-iron wheel and at the same time retains the ductility, which is an inherent and valuable property of wrought solid steel wheels.

Regarding plain annealed solid steel wheels, it should be stated that they are now being made under a specification which insures the acceptance of a high-grade product only. Improvements in the process of manufacture have been made so that it is now entirely possible to carry the 9 and 10-ton tender wheel loads and obtain greater mileages between turnings with fewer shelled wheels.

Before concluding, acknowledgment should be made of the energetic manner in which manufacturers are constantly striving to improve and produce steel products which are suitable for exacting service requirements. Cooperation has been the key note of the relationship between manufacturers and railroad officials, with beneficial results to both. The railroads expend many thousands of dollars in keeping accurate records and making investigations to compare the quality of the different brands of material purchased and from these have been able to advise the manufacturer of their relative merit. It is only through such advice that manufacturers become aware of operating and traffic difficulties, so that improvements can be effected to secure continued safe and satisfactory service, as well as maintain the railroads on a high plane of development for the good of the country.

War Expansion of Our Steel Trade with Japan

The extent to which trade in iron and steel between Japan and the United States has expanded as a result of the war is shown by the following table of exports from this country to Japan compiled from official Government data:

Exports of Leading Iron and Steel Products from the United States to Japan

	1913	1916	1918
Wire nails, lb.....		56,007,096	39,362,292
Cast pipes and fittings, lb.....	9,824,333*	11,589,750	24,075,465
Wrought pipes and fittings, lb.....	13,732,846*	23,752,116	47,173,025
Steel rails, gross tons.....	20,820	2,979	81,243
Galvanized iron and steel sheets, lb.....		4,628,607	5,337,953
Steel plates, lb.....		174,100,197	269,686,510†
Steel sheets, lb.....	16,241,961	12,934,539	120,642,862
Structural iron and steel, gross tons.....	9,981	24,405†	24,197
Tin plates, lb.....	509,245	54,230,362	82,080,957
Barbed wire, lb.....		18,540,663	458,627
All other wire, lb.....		47,773,438	67,450,924
Metal working machinery.....		\$801,449	\$4,047,172
Machinery, n.e.s.....		200,584	1,150,479

*1915. †\$5,514 in 1917. \$577,335,991 lb. in 1917, or 50 per cent of the total.

The most striking feature of this table is the growth in the exports of steel plates and sheets. The total of these two products sent to Japan in 1913 was only a little over 16,250,000 lb. but in 1918 this had increased to over 390,000,000 lb. of which steel plates alone comprised 66 per cent. In steel rails, pipes and fittings and in tin plates the absorption by Japan has also been phenomenal.

In those metals of which export statistics are available, the exports to Japan have been heavy. For 1913 there are no data as to separate items but in 1918 Japan took 2,063,933 lb. of nickel, nickel oxide and matte as against only 245,920 lb. in 1916. In 1916 Japan received from the United States 33,289,467 lb. of lead and 17,231,731 lb. in 1918. Exports of spelter to Japan in 1916 were only 334,108 lb. but in 1918 they had expanded to 7,567,719 lb.

A spring hammer drill for drilling holes in brick, concrete and stone, and provided with an automatic drill turning mechanism, is announced by the Star Expansion Bolt Co., 147 Cedar Street, New York.

Profits of Iron Business Discussed

Declared to be Reasonable in Report Issued by Bureau of Mines—No Fear Entertained in Regard to Exhaustion of the Great Ore Deposits of the Lake Superior Region

WASHINGTON, July 1.—A report on the method of administering leases of iron ore deposits belonging to the State of Minnesota has just been issued by the Bureau of Mines. The investigation was made under the direction of J. R. Finlay, mining engineer, following a request by J. A. O. Preus, State auditor of Minnesota. The general purpose of the inquiry was to ascertain whether in the administration of the properties in the past the State had received such returns as could reasonably have been expected; and whether any recommendations could be made as to improvements in the administration of the properties in the future. Conclusions along this line are summarized in the report as follows:

The State leases provide for a royalty in nearly all cases of only 25c. a ton. Private owners exact much higher royalties on many areas, even as high as \$1 a ton. One practical conclusion that we are warranted in making is that the State is justified, on account of the low royalties, in being as exacting as any other proprietor in regard to the grade of ores that shall be shipped; that is, the State should insist that ores shall be mined to the lowest commercial grade. So far as the operators are concerned, a complication is brought in by the fact that in a number of places they are working mines that have been subleased under higher royalties. It seems hardly fair, however, to the people of the State that an operator should refuse to mine at \$1 a ton royalty an ore that would be merchantable at 25c. royalty. The fault is not with the State's methods, but with the commercial transactions that followed after its cession of the land. The proper way to adjust the embarrassment brought about by this situation is for the operators to negotiate with the original lessees for modifications of royalty conditions that they themselves made burdensome.

Making New Leases

"A further interesting question is the amount of royalty that the State could ask in the event of making new leases. Some leases have actually been made providing for a royalty of 50c. a ton. For an average ore this sum appears to be reasonable. A more logical method of fixing royalties would seem to be a sliding scale based on the grade of the ore higher for higher grade ores and diminishing to a nominal amount as the commercial limit is reached. To make such a scale scientific it should be constructed with some reference to each individual deposit.

"In general the royalty system seems particularly desirable when the proprietor is a State government. Such an organization is not well qualified to conduct an ordinary competitive business, and has a much better reason for indulging in an indirect way of utilizing the property than a private owner. For one thing, the State is not an absentee landlord. But for the very reason that the function of the State Government is to promote fair play among its citizens and also in a general way to promote the prosperity of the community, expectation that a State will avoid a grasping or oppressive attitude in the exploitation of its properties seems reasonable. Apparently the better public policy for a State would be to put its royalties at a figure somewhat lower than would be justified by the average commercial conditions, rather than to attempt to get as high returns as a private owner might, by taking chances, succeed in obtaining. By so doing the State would certainly avoid having its properties shut down, and its income curtailed every time the market showed a little depression."

Extent of Ore Deposits

Discussing the permanence of the supply of ores, the report says that there is not much ground for anxiety

and that there will probably be no difficulty in keeping up shipments of the present grade from the Minnesota deposits for 30 years to come.

In this connection the report says:

"Much has been said about the gradual lowering of the grade of Lake Superior ores, and expectations have been raised that this process would continue. There is, however, excellent reason to believe that it will not continue, at least so far as shipments are concerned. The grade is likely to be maintained at least 50 per cent natural for a long time to come. Ores running less than 50 per cent natural, if shipped at all, are pretty sure to be washed. Probably a great deal of the wash ores on the range has not been fully estimated. The reports of the Minnesota Tax Commission show available something like 1,450,000,000 tons of ore of recognized present commercial grade. That is enough ore to maintain present shipments for more than 30 years. At the rate shipments are increasing the reserves would probably be exhausted sooner—a good deal sooner. But, as a matter of fact, additional discoveries are constantly being made which go to maintain these reserves. Prospecting for new ore bodies or for extensions of old ones does not appear to be very active; one reason, no doubt, being that an ore body that is not needed for immediate exploitation becomes a burden upon the owners because they have to pay taxes on it. I am confident that enough ore will be found to keep up the shipments of approximately the present grade for 30 years, even with the expectation of greater shipments. Now, an ore reserve of 30 years is a pretty good stabilizer for business conditions. It is hardly possible as a practical industrial matter to look that far ahead. If an ore is not going to be valuable until the end of 30 years remarkably convincing argument will be required to satisfy anyone that it is worth anything now."

Minnesota's Ownership

The extent of Minnesota's ownership of ore deposits, and further details regarding the terms of the leases, are given as follows:

"The State owns 31,560 acres on the Mesaba range, within the productive area as now recognized; 4640 acres on the Vermilion range, and 4200 acres on the Cayuna range; a total of 40,400 acres. Also, there are 520 acres of State land on the magnetic iron formation at the east end of the Mesaba range within the area covered by Leith's map of that range, and still more land beyond the limit of the map. This magnetic formation may have some value in the future, but has none at present.

"These lands are known to contain at least 168,000,000 tons of present commercial ore, according to the estimate of the Minnesota Tax Commission, which the writer believes to be conservative.

"The ores known in these lands are leased mainly under the State leasing law of 1889, under leases that expire at an average date of 1952, thus having 34 years to run. The principal terms of these leases are 'a royalty of 25c. a ton' and a covenant on the part of the lessee that 'he will open, use and work said mines in such manner as is usual and customary in skillful and proper mining operations of such character.'

"Evidently the proper administration of these leases on the part of the State requires judgment (1) as to what constitutes proper working of a mine—that is, mining in such a way that ores are not wasted; (2) upon what ores shall the State demand royalties.

"The full force of these points is not evident until one recognizes the principal facts of the occurrence of the ores and of the historic development of iron manufacture in the country at large. Interpretations of these facts and expectations based on them differ

greatly, causing widely different views to be entertained as to the value of the property, the amount of ore to be expected, and the royalty that the State may ultimately receive. Thus, according to the tax commission's estimate, royalty being calculated at 25c. a ton, the amount to be paid the State will be \$42,000,000. However, there are fair reasons to suppose that ultimate return will be at least twice that much. Therefore, administration of the lands in such a way as to permit every opportunity of making this expectation good is of considerable importance."

Profits of the Iron Business

That profits in the iron business are only moderate is the conclusion drawn in the report. Figures regarding profits are based only on pre-war conditions. Although the investigation was made largely during 1918, it was considered advisable for the particular purposes in view to eliminate war costs from consideration. Computations are made on a basis of profits up to the end of the year 1915.

The report says:

"Proceeding on this basis, it is evident at a glance that the profits in the iron business are not spectacular or unreasonable. In the period of five years, 1911 to 1915, inclusive, we find the following facts: The total average investment of the Steel Corporation for the period was about \$1,600,000,000. The average amount of bonds issued was about \$600,000,000, calling for interest payments of approximately \$30,000,000 a year. The total gross earnings on investments were \$446,000,000, being an average of 5.5 per cent.

"The total earnings after setting aside funds for additional investments were \$332,000,000, being an average of 4.1 per cent on the investment. The average payments on \$362,000,000 in preferred stock was 7 per cent. The average payment on \$508,000,000 in common stock was 4 per cent. During the 5 years these payments resulted in a decrease of surplus of \$30,000,000 and a decrease of inventories of \$15,000,000.

"The production by years was as follows:

Year	Tons	
	Iron ore	Finished products (iron and steel)
1911.....	19,933,631	9,476,248
1912.....	26,428,449	12,506,619
1913.....	28,738,451	12,374,838
1914.....	17,034,981	9,014,512
1915.....	23,669,676	11,762,639
Total.....	115,805,188	55,134,856

"Of this production Minnesota furnishes 70 to 80 per cent of the iron ore, and from this an equal or slightly higher percentage of the finished products is derived.

"From this it will be seen that the average gross earnings per ton of finished iron and steel product was about \$8. The total profit per ton of iron ore was less than \$4.

Plant Investment

"We have now arrived at a point which may not be fully understood, namely, that these earnings are obtained only by carrying the full process of manufacture through to the ultimate consumer. It appears that the plant investment actually required to put the company in position, through possession of its own ores, transportation equipment, blast furnaces and manufacturing plants, to deliver a ton of finished iron and steel to the consumer is more than \$100, and that the average gross profit for delivering that ton is \$8, or 8 per cent on the investment, from which must be deducted certain amounts for plant investments necessary in order to maintain or increase the business. Hence, out of this \$8, it has been barely possible to pay, on an average, about \$6.50 in the form of interest on bonds and dividends on stocks.

"There is only one conclusion to be drawn from these figures, namely, that the profits in the iron business are moderate—in fact, barely sufficient to warrant the business being called a profitable one."

The report calls attention to the fact that profits which appear enormous dwindle when the entire invest-

ment is taken into consideration. In this connection it says:

Capital Required

"It may be of interest to draw attention to the amount of capital required actually to work an iron mine. Let us take the best mine in the Lake Superior region as an example. The property is owned jointly by the United States Steel Corporation and the Mahoning Ore Co., preponderately by the former, and the mine is called the Hull-Rust-Mahoning. This property embraces part of an enormous ore body in the central part of the Mesaba range at the town of Hibbing. The ore is taken from one great pit. During 1916 and 1917 the output from this ore body was between nine and ten million tons a year, but during the prior life of the Steel Corporation—that is, during the 15 years, 1901 to 1915, inclusive—the average shipment from these mines was about 3,000,000 tons a year. Undoubtedly the ore from this property is decidedly higher in grade than the average and can be mined much more cheaply than the average. Being an open-pit mine, there is to the eye no great evidence of the large investment required to operate it.

Cost of Mining

"The point the writer desires to draw attention to is that the simplicity of conditions surrounding this mine is deceptive. If we suppose that this mine is capable of producing 10,000,000 tons of ore a year and 5,000,000 tons of pig iron, and the same amount of finished product, we must realize that the sum total of plant investment necessary to make an actuality of this operation is between five and six hundred million dollars, although undoubtedly a very small part of this sum is invested in the State of Minnesota. It thus makes a great deal of difference in our conception of the profitability of this property whether we take into consideration the whole business or only that part of it visible in the State. At a rough estimate, ore can probably be produced from this property at about the following costs in normal times:

	Per ton
Cost of mining.....	\$0.25
Actual cost of rail freight to Lake ports.....	.40
Cost of Lake transportation.....	.50
Total cost, laid down at Cleveland.....	\$1.15
Royalty.....	.25
Making a total of.....	\$1.40

"The ore would bring under normal conditions probably \$4 a ton in Cleveland, giving a profit of more than \$2.50 a ton. Thus, on the maximum output, the profit would be \$25,000,000 a year, but on the average output during normal times it would be \$7,500,000 a year.

"Either return seems staggering if one has in view only the mine itself. But if we consider the amount of capital actually invested we find that on an output of 3,000,000 tons a year there is required an annual profit of not less than \$12,000,000 and that on an output of 10,000,000 tons a year the profit should be not less than \$40,000,000, in each case carrying the process through to the delivery of manufactured iron and steel.

"Furthermore, it is to be noted that such a mine, being the best iron mine in North America, is not a fair representative of the business as a whole, but is simply a bonanza, the existence of which makes the business more profitable than it could be otherwise.

"It seems fair to draw attention to these points principally in order to show that the iron business can hardly be understood if taken up in isolated detail, and that it is no simple matter to decide what portion of the profits of the business really belong to the mines and what proportion to the investments made elsewhere."

O. F. S.

E. E. Maher announces the formation of the Maher Engineering Co., with offices in the Michigan Boulevard Building, Chicago, to handle the sale and installation of Erie Engine Works high speed engines, the Sims Co. feed water heaters, Dayton-Dowd Co. centrifugal pumps, Wagener Steam Pump Co. pumps, and Pratt Engineering & Machine Co. fertilizer and sulphuric acid machinery.

Tonnage of Iron and Steel Exports Increases

Movement Heavier in May than in April—Decrease Compared with a Year Ago—Shipments of Rails Decline in May, as Do those of Tin Plate

WASHINGTON, July 1.—Iron and steel exports for May show an increase in tonnage compared with April of this year, but a decrease compared with April, 1918. The figures compiled by the Bureau of Foreign and Domestic Commerce reveal a decrease in value of exports from \$100,607,254 in May, 1918, to \$86,902,851 in May, 1919. The valuation for April, 1919, was \$88,896,975. For the 11 months ending May, 1919, the total exports of iron and steel were \$943,988,146, against \$1,041,693,038 for the corresponding period a year ago.

Exports of Iron and Steel—Gross Tons

	May		Eleven Months	
	1918	1919	1918	1919
Ferromanganese	477	545	4,590	2,054
Ferrosilicon	237	4,309	8,564	7,861
All other pig iron	21,853	32,233	340,791	295,739
Scrap	266	1,667	22,067	3,635
Bar iron	3,219	5,172	45,096	78,700
Wire rods	10,313	5,429	182,040	13,098
Steel bars	48,970	45,094	579,148	438,562
Billets, ingots and blooms, n.e.s.	159,299	20,771	1,837,919	865,679
Bolts and nuts	2,478	37,728	28,095	59,764
Hoops and bands	3,902	4,061	55,107	50,829
Horseshoes	573	635	8,929	2,278
Cut nails	478	406	4,695	3,296
Wire nails	6,278	10,466	103,910	82,458
All other nails, including tacks	857	1,785	12,116	16,130
Cast-iron pipes and fittings	10,747	3,360	76,338	35,305
Wrought pipes and fittings	6,862	28,368	93,223	146,831
Radiators and cast-iron house-heating boilers	131	382	2,624	3,170
Railroad spikes	1,975	2,966	14,500	16,406
Steel rails	52,211	76,134	405,278	554,700
Galvanized sheets and plates	7,109	9,506	71,888	71,768
All other sheets and plates	3,982	5,259	51,860	217,043
Steel plates	48,949	54,400	428,576	669,769
Steel sheets	15,922	20,852	164,063	139,478
Ship plates, punched and shaped	4,715	1,377	31,597	18,866
Structural iron and steel	13,717	36,411	223,076	290,742
Tin and tern plates	37,350	14,186	221,269	224,642
Barb wire	19,579	9,165	161,952	186,460
All other wire	10,792	14,383	157,128	157,178
Total	493,241	447,050	5,335,872	4,652,441

The tonnage figures for May, 1918, were 493,241 gross tons, while for May, 1919, there was a drop to 447,050. For April, 1919, the tonnage was 408,204. For the 11 months ending May, 1919, the tonnage of iron and steel was 5,335,872; and for the 11 months ending May, 1919, the aggregate was 4,652,441. The pig iron exports increased from 22,567 gross tons in May, 1918, to 37,087 in May, 1919. The exportation of billets, ingots and blooms dropped from 159,299 gross tons in May, 1918, to 20,771 in May, 1919. In April, 1919, the exports were 11,488 tons. The index to this decrease is furnished by the fact that the exportation for these months to France fell from 45,842 to 8,069; and to the United Kingdom from 77,732 to 9975 gross tons.

There was an interesting story in the exportation of steel rails, due largely to the demand from Japan. The exportation to Japan rose from 6,070 in May, 1918, to 60,463 tons in April, 1919, but declined to 14,224 in May, 1919. There was also shipped to British South Africa, 8,177 tons that did not figure at all in last year's list. The rail exportation to France fell from 18,229 a year ago to 14,874 tons last May; and to Canada, from 18,671 to 3,056 gross tons. The exportation of structural iron and steel increased from 13,717 to 36,411 in the year, but last April it amounted to 42,550 tons.

The exportation of tin and terne plate dropped from 37,350 gross tons in May, 1918, to 14,186 in May of the present year. In April the tonnage exported was 19,101.

The exportation of machinery, tabulated on page 31, showed an increase of approximately \$2,500,000, and rose from \$29,099,591 in May, 1918, to \$31,524,342 in May, 1919. In April, 1919, the value was \$33,448,316.

For the 11 months ending May, 1918, the exportation of machinery was \$267,556,833, while for the same period of this year it aggregated \$299,578,884. Among the items, gasoline engines dropped from \$3,706,031 to \$2,198,320, although steam engines increased from \$3,832,370 in May, 1918, to \$4,280,829 in May, 1919. Among the latter was a single item of 45 locomotives sent to Italy, with a valuation of \$2,115,000.

The exportation of metal working machinery dropped from \$5,848,563 in May, 1918, to \$4,290,019 in May, 1919. The exportation made to France dropped from \$2,055,162 to \$1,371,113, and exportation on the same item to the United Kingdom dropped from \$2,003,917 to \$655,619. It is interesting, however, to note that sewing machinery increased in exportations from \$546,451 in May, 1918, to \$1,087,016 in May, 1919; textile machinery from \$729,999 to \$1,254,041; and typewriters from \$730,824 to \$1,385,046.

Imports of iron and steel totalled 19,644 gross tons in May, 1919, as against 14,385 gross tons in May, 1918. The total for the 11 months ending in May was 171,136 gross tons, as against 187,895 gross tons for

Imports of Iron and Steel—Gross Tons

	May		Eleven Months	
	1918	1919	1918	1919
Ferromanganese	4,138	27,520	27,520	22,206
Ferrosilicon	100	260	5,273	5,895
All other pig iron	2,168	16,618	4,348	4,348
Scrap	3,546	10,130	63,013	84,433
Bar iron	39	12	2,360	1,238
Structural iron and steel	248	155	7,127	2,283
Steel billets without alloys	1,974	182	34,373	24,035
All other steel billets	1,617	97	8,952	2,853
Steel rails	4,878	7,985	14,994	14,994
Sheets and plates	84	108	2,045	733
Tin and terne plates	1	32	49	49
Tin scrap	628	311	7,516	6,091
Wire rods	2,011	22	5,475	1,978
Total	14,385	18,324	187,895	171,136

Imports of Manganese, Ore and Oxide

	Gross Tons			
	May		Eleven Months	
	1918	1919	1918	1919
Manganese ore and oxide of	29,837	19,644	519,591	440,902

the corresponding 11-month period. Imports of manganese similarly were larger in May of this year than a year ago, while there was a decrease in the 11 months' total.

According to *L'Usine*, the committee which was appointed in Luxemburg to consider the economic questions created by the war has finished its report. The necessity of forming a triple alliance between France, Belgium and Luxemburg has been admitted. The alliance will have the annual control of 55,000,000 tons of coal and 12,500,000 tons of steel. Hence the predominant position which was formerly held by Germany in the world's steel market would be destroyed and she would be dependent upon the Allies for supplies of ore. Moreover, such an alliance would solve the problem of the future policy of the Duchy and put an end to the Franco-Belgian competition for supremacy in that country.

Exports of Machinery

	May		Eleven Months	
	1918	1919	1918	1919
Adding machines	\$177,628	\$363,106	\$1,886,816	\$3,002,572
Air compressing machinery	378,042	454,997	1,541,940	3,092,818
Brewers' machinery	553	1,506	227,685	146,767
Cash registers	54,589	311,530	479,388	1,894,313
Parts of	6,938	26,212	58,891	156,358
Concrete mixers	42,000	7,597	285,948	227,102
Cotton gins	8,131	38,602	125,680	274,659
Cream separators	93,837	76,048	562,249	873,054
Elevators and elevator machinery	214,367	741,317	1,803,792	2,889,803
Electric locomotives	16,740	37,000	153,911	315,458
Gas engines, stationary	65,853	37,302	551,573	501,144
Gasoline engines	3,706,031	2,198,320	31,389,241	30,771,096
Kerosene engines	951,970	812,472	5,631,523	8,319,177
Steam engines	3,832,370	4,230,829	38,068,042	26,591,110
All other engines	273,904	172,336	3,368,042	4,585,507
Boilers	258,511	381,204	3,360,474	5,225,418
Boiler tubes	601,181	1,048,587	5,938,142	8,108,514
All other parts of engines	2,815,416	1,822,763	18,503,935	23,858,485
Excavating machinery	268,139	214,083	1,128,915	959,477
Milling machinery, flour and grist	158,217	239,938	947,322	1,820,923
Laundry machinery, power	40,381	40,832	347,399	428,615
All other	48,769	37,189	279,501	313,154
Lawn mowers	20,632	48,394	223,253	338,075
Lathes	1,096,708	513,067	14,666,967	8,414,867
Other machine tools	1,312,310	820,891	10,326,009	11,628,397
Sharpening and grinding machines	644,007	396,977	5,992,247	6,589,116
All other metal-working machinery	2,795,538	2,559,084	23,122,706	24,289,272
Meters, gas and water	26,942	56,407	430,494	575,181
Mining machinery, oil well	212,841	283,783	1,871,491	3,259,395
All other	629,663	910,832	9,702,738	8,483,949
Paper-mill machinery	216,608	408,888	1,773,083	2,338,658
Printing presses	111,636	208,760	1,236,173	2,235,489
Pumps and pumping machinery	650,972	647,480	6,056,570	6,392,345
Refrigerating and ice-making machinery	80,667	231,904	1,337,965	1,885,669
Road-making machinery	61,130	98,866	477,902	749,603
Sewing machines	546,451	1,087,016	7,214,952	10,477,299
Shoe machinery	112,835	241,221	1,396,850	1,789,609
Sugar-mill machinery	555,401	541,081	11,158,459	9,387,282
Textile machinery	729,999	1,254,041	4,932,340	9,699,213
Typesetting machines	120,223	431,476	1,119,861	2,834,494
Typewriting machines	730,824	1,385,046	6,905,018	10,100,341
Windmills	68,703	96,405	988,858	836,863
Wood-working machinery, saw mill	86,931	153,837	877,392	1,396,714
All other	54,842	190,851	874,256	1,328,116
All other machinery and parts of	4,225,161	5,664,265	38,230,425	51,191,413
Total	\$29,099,591	\$31,524,342	\$267,556,833	\$299,576,884

SURPLUS PLANTS

Major Sloan Describes the Policy to Be Followed by the Government

WASHINGTON, July 1.—Disposal of between 400 and 500 manufacturing plants, costing the Government approximately \$500,000,000, is the task confronting the plant facilities section of the office of Director of Sales of the War Department.

Up to date only about 20 of the plants have actually been declared surplus, but most of the others will ultimately be turned over for disposal, unless, as will be done in some cases, the war contractors take them over under the terms of the settlement of their contracts.

Included among the surplus plants are the smokeless powder plant at Charleston, W. Va., three complete picric acid manufacturing establishments and three plants for the production of air nitrates. There are a number of chemical plants of various kinds for the production of various needed materials for which there is now little or no demand.

The plants are in various stages of completion, some of them having been actually in operation, while others were scarcely started when work was ordered stopped. Some are entirely new structures, while others are extensions of privately owned factories, the Government having paid the cost of construction and under the contracts with the private companies holding title to the property. In many cases, the operating company is willing to purchase the added facilities, but oftentimes that is not the case.

Heading this section of the Director of Sales' office is W. G. Sloan, who served during the war as major with the Twenty-second Engineers overseas, his position previously having been as vice-president and chief engineer of the contracting firm of MacArthur Bros., New York.

Mr. Sloan, when asked how large a percentage of the original cost would be realized by the Government, said he had very little idea, as the work is barely getting under way and the inventory of the plants is

not complete, but he expects to realize more than 50 per cent of the cost. Latest figures regarding the sale of surplus materials of all classes indicate that 79 per cent of the original cost has been realized on all sales from Jan. 1 to June 20.

"We are hopeful that most of these plants can be absorbed into the industries of the country," continued Mr. Sloan. "It seems to us that there ought to be somebody willing to take most of them. Our idea is to acquaint ourselves with the industries of the country and find out what companies are in need of additional facilities. Then we will try to pick out a plant that will fill the needs and endeavor to make an arrangement for the sale."

"Of course these plants were built at high costs under war conditions and there must necessarily be a sacrifice of values. By a thorough study of the situation and of the needs of the country, we hope to keep the loss down to the smallest possible figure. Failing to find a purchaser there is always the alternative of wrecking a plant."

"We know that there are between 400 and 500 plant facilities for which the War Department probably will have no use. Until the claims board completes its work it will be impossible to tell just how many of them will come to us. "The claims board may dispose of a considerable number of plants in the settlement of contracts. Wherever the contractor will take over the plant, this will be done as a part of the settlement. After the claims board settles a contract, the plant is turned over to the Bureau of the War Department for disposition. When the bureau declares the plant to be surplus, it comes to us. So far not more than 20 plants have been through this process."

Sales of all surplus war materials during the week ended June 20 totaled \$33,678,691.89. This was nearly three times the figure of the previous week, the sharp increase being due to the sale of large stocks of wool from which a total of more than \$27,000,000 was realized. The Division of Military Aeronautics reported sales amounting to \$2,721,148.50, the Ordnance Department \$840,215.92, and Aircraft Production \$274,563.22. Between Jan. 1 and June 20 the War Department derived \$33,712,636.75 from the sale of surplus materials held in the United States.

Draw Bench with Guide Rods

The illustrations show a new type draw bench that is manufactured by the Winterhoff Tool & Machine Co., Elkhart, Ind. The machine is designed to draw straight and accurate gage tubing on mandrils through dies and may also be used for broaching purposes.

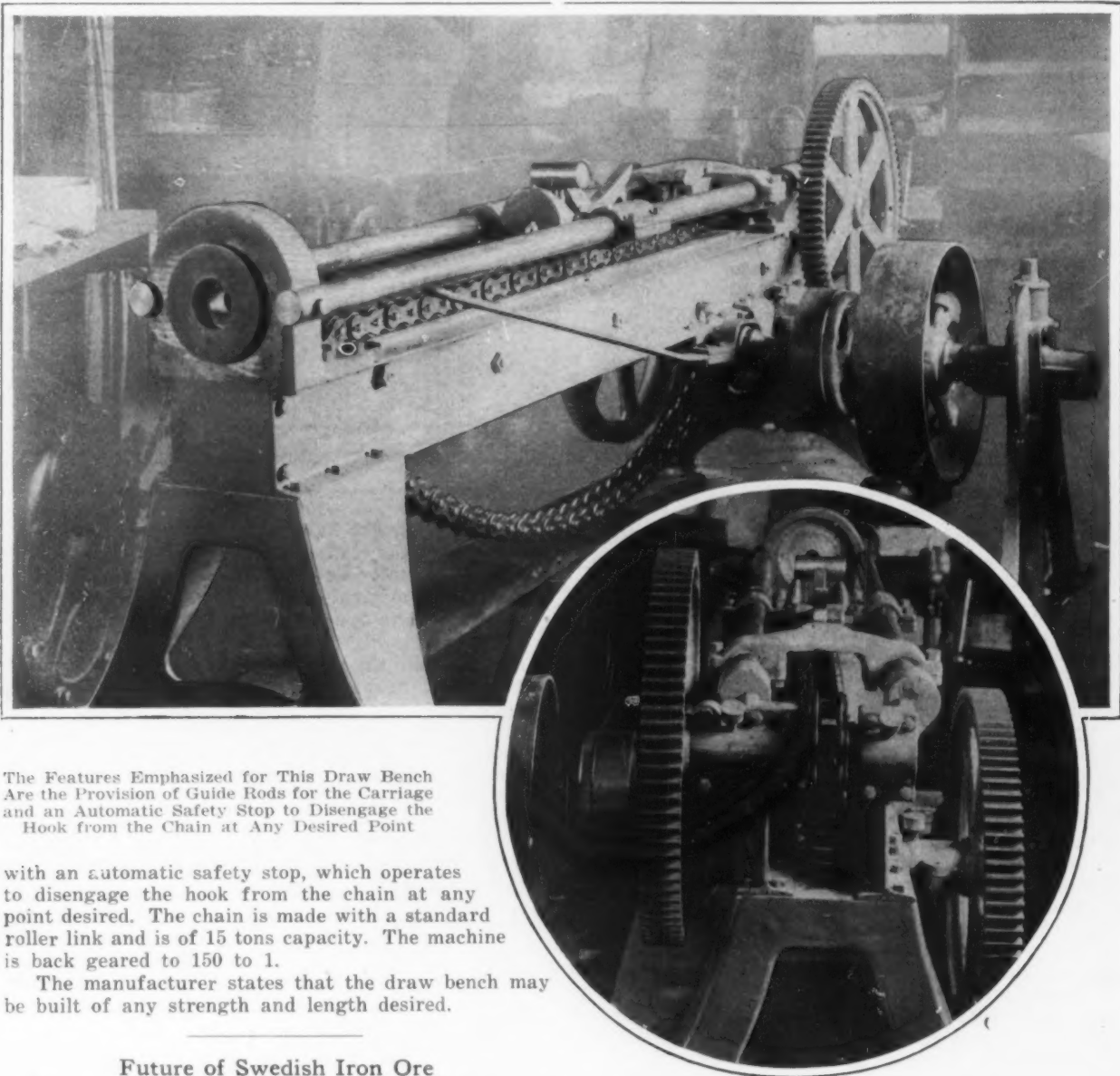
Among the special features emphasized is the provision of guide rods for the carriage. It is explained that these rods are in alignment with the pitch line of the sprocket, with the hook at its axes, and the center of the holes in the carriage and head of the machine.

It is pointed out that the machine is also provided

New Principle in Oil Burners

Oil burning machines equipped with burners made on a new principle are announced by the Clayton & Lambert Mfg. Co., Detroit. The burner, it is stated, is designed to economize in the use of fuel and compressed air and to use a relatively large amount of free air. It can be operated by either compressed air or steam and uses crude oil, fuel oil, kerosene or distillate.

Numerous uses for the machines are suggested including preheating before welding, annealing, brazing, heating and drying large ladles, skin drying molds and cores, and lighting cupolas in foundries.



The Features Emphasized for This Draw Bench Are the Provision of Guide Rods for the Carriage and an Automatic Safety Stop to Disengage the Hook from the Chain at Any Desired Point

with an automatic safety stop, which operates to disengage the hook from the chain at any point desired. The chain is made with a standard roller link and is of 15 tons capacity. The machine is back geared to 150 to 1.

The manufacturer states that the draw bench may be built of any strength and length desired.

Future of Swedish Iron Ore

The question as to the expediency in the future of Sweden exporting its ore or the iron made from it was discussed recently in a lecture by Professor Anderson of the Commercial University of Stockholm. He said that if Sweden managed her affairs wisely her ores would suffice for both purposes. She must push her ores in the world market. Part of them should be used for the iron manufacturers of the home country, and there her efforts should be specifically directed to high-quality products, as that was the only department in which she could hope successfully to compete with other markets. None of the non-phosphoric ores of Bergslagen should be allowed to be exported.

The Swedish iron ore exports were still low and aggregated only 92,000 tons last April, as against 213,000 tons in April, 1918, and 259,000 tons in April, 1917. Pig iron exports were also less (9917 tons) in April, 1919, than in the same month last year, when they were 15,382 tons.

French Exports for German-Austria

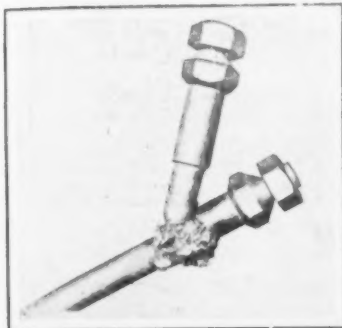
L'Usine reports that, according to the decree of Feb. 19 the French Government has decided to authorize French exporters to resume commercial relations with German-Austria. They are reminded that the goods exported are only destined to meet the home requirements of that country, and all re-exportation to countries with which commercial relations are not restored are prohibited, except by special permission of the Inter-Allied Commission at Vienna. It is forbidden to import into Austria any articles, machines or material, which can be used for military purposes.

The order for high-speed drills amounting to about \$50,000, which was recently placed by the Pennsylvania Railroad for general shop use, was awarded to the Latrobe Tool Co., Latrobe, Pa., not the Vanadium Alloys Steel Co., Pittsburgh, as has been stated.

CORRESPONDENCE

A New Method for Joining Metals

To the Editor: The accompanying photograph is that of two nickel steel bolts for automobiles that were welded together by friction.



Two Bolts Welded by Friction

with the result shown. Notice how the metal has been chewed off.

Perhaps this accident opens up the way for a new process of welding. The photograph was taken at the plant of the Watkins Screw Co., Bridgeport, Conn.

J. J. MCINTYRE,
235 Beechwood Avenue,
Bridgeport, Conn.

Oxygen for Frozen Iron Notches

To the Editor: Referring to E. P. Ross's communication to THE IRON AGE of June 19, 1919, on "Oxygen for Frozen Iron Notches," his claim as the originator of this method of treatment in 1903 was after my application of the identical method in July, 1902. I had been employed during the period 1900 to 1902 as a blast-furnace chemist for the Virginia Iron, Coal & Coke Co., Bristol, Va.-Tenn., and in April, 1902, I was promoted to the vacancy, caused by the resignation of Percy Johnson, to the superintendency of the Buena Vista furnace.

In the month of July I had the misfortune to experience my first bad slip of zinc oxide from the top of the furnace, a routine experience with blast furnaces using iron ore from Oriskany mines, Virginia, which carried zinc oxide to the extent of 0.35 per cent. This oxide sublimed and formed a ring at the furnace top, and then after gaining in size and weight as the charges were reduced, it would fall and chill the bosh to such an extent that all reactions stopped and the fused mass of material closed notches and tuyeres. As I had just taken command of the furnace, this unfortunate slip seemed likely to bring my business associations with the management to an untimely close.

I tried the hydrocarbon blow pipe to fuse out the cinder notch and other ports, but with small success, and was just on the point of telegraphing for aid from more experienced furnacemen, when one night, while thinking of some practical solution of the difficulty I found myself in, I recalled the successful application of oxygen to the combustion of graphitic carbon in the silicon determination and, going back to the laboratory, secured two tanks of oxygen and a porcelain combustion tube. Connecting up the tube with the tank by means of pipe and hose, I introduced the open end of the porcelain tube into the iron notch, which had been repeatedly drilled, and now presented a dull red appearance, and opening the tank valve, started a jet of oxygen playing on the red-hot iron. The intense heat caused by this made itself evident by a small stream of fused oxide which slowly flowed. After using up all the gas in the second cylinder sufficient softening of the metal had taken place to make it possible to drive a chisel bar through the spongy metallic mass to

the liquid iron in the hearth of the furnace. At the same time the furnace foreman had succeeded in drilling out the obstructions in front of one tuyere and on starting up the blowing engines we were enabled to get some circulation of hot blast through the bosh and gradually heated up the furnace.

The results were good, but in those days high pressure oxygen was unknown, and my supply was not sufficient to get the best results from the process. It did not occur to me to patent the process, because the use of oxygen as an aid in chemical laboratory operations such as quickly ashing coke and burning off silicons was then well known to most iron chemists and I did not consider it a patentable invention. The use of oxygen on the frozen notch was a novelty to the keepers and foreman, who assured me they had never heard or seen of its use at blast-furnace plants before. To an iron chemist, who of course was familiar with the oxygen jet in the laboratory, the employment at the furnace on a larger scale process would naturally suggest itself, and it is of interest to know that the same idea occurred to Mr. Ross a year after I had applied the process at the Buena Vista furnace, Buena Vista, Va.

RANDOLPH BOLLING.

U. S. Navy Yard, Norfolk, Va., June 26, 1919.

Organized Labor to Study the Dollar

To the Editor: I note in the daily press that the convention of the American Federation of Labor at its Atlantic City meeting voted to appoint a committee to investigate the causes for the decreasing value of the dollar. This is something in which both capital and labor can successfully unite, and it is to be hoped that labor will take the lesson to heart, when the causes are found, as to my mind nothing, except the recent war, has acted with greater effect to reduce the value of the dollar, than the policies and practices of organized labor.

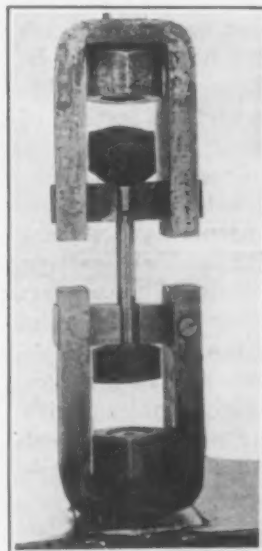
G. K. HOOPER,
President, Hooper-Falkenau Engineering
Co., New York.

Tensile Test-Specimen Holder

To the Editor: The illustration shows a modification of the Zimmerschied test-specimen holder developed by the author in order to save labor in preparing specimens and making tests. The fixture is self-aligning, insuring a straight pull on the specimen.

To insert a specimen it is only necessary to bring the jaws of the machine close together and slip the reduced part of the specimen through the slots in the cross bars.

H. H. MATHIS,
Laboratory Division, Winchester Repeating Arms
Co., New Haven, Conn.



Holder Designed for Rapid Placing of Test Specimens

machinery, factory and mill equipment and similar goods.

The Heald Machine Co., Worcester, Mass., has awarded "100 per cent American" buttons to all of its employees, numbering more than 500. This was done as a recognition of the fact that not a single alien is in the employ of the Heald company.

The W. L. Romaine Machinery Co., Milwaukee, has been organized by Wilbur L. Romaine, 2114 Grand Avenue, who resigned recently as secretary of the Badger-Packard Machinery Co., Milwaukee. The new corporation has a capital stock of \$50,000 and will deal in machine tools,

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Progress in Readjustment

Some observers are disturbed because of the number and importance of the problems the world is now called upon to solve. But it is better to look upon the progress that is being made than to contemplate simply the size of the task. These things are frequently looked at from the worst viewpoint. We recall how certain things were made to appear during the war. There was the matter of coal supply. To make sure of sufficient coal the stimulation of production and the curtailment of consumption were preached incessantly. When the war ended the work was found to have been done so well that there were large stocks of coal, which proved rather inconvenient. In every Liberty Loan campaign the possibility of failure was preached, but the loans were all largely oversubscribed.

The relations between employers and employees in the United States are being discussed vigorously and at great length. From one viewpoint it might appear that the most serious dangers have arisen, but on the other hand it may be taken that great good is being accomplished because men are working on the problem instead of ignoring it.

The industrial situation in Great Britain is being painted in sombre colors; but the fact seems to be simply that the British people have a great task ahead, a problem to solve, and are getting through with it in their usual style. The greatest difficulty in Britain, as a matter of fact, is the extreme slowness with which the Government is divesting itself of its war powers and its interference with trade. There is a striking contrast with the quickness with which our own Government relinquished the leading strings; but what Britain is doing is essentially British.

It should be recognized that all the problems are problems that must be solved as they come. There is no royal road to the solution. The fantastically complicated system of reconstruction that Britain endeavored to work out during the war, and which gave rise to much unfavorable comment in the United States because we had nothing to match it, is certainly not functioning and apparently has been entirely forgotten. The problems are being solved as they come, and could not have been solved in advance.

The industrial realignment is really going on at considerable speed, and the fact that new problems arise should not becloud the fact that much has been accomplished. Industrial unrest in the United States has been disappearing not so much through the application of remedies devised for the purpose as by the growth of business. Beyond question that growth will continue. On the Continent there are undoubtedly serious conditions, as has lately been pointed out very clearly, but no one should assume that remedial influences will not exist. It is necessary to take the full measure of problems before they can be solved. On the whole the world has made much progress since the armistice and it is going to continue making progress.

More of Things, Not Less

The most hurtful thing in industry to-day is the extent to which the idea prevails that men can and are entitled to get out of the work in which they are engaged more than they have put into it. Government backing of so many industries in war time doubtless has helped the idea to grow. Certainly the common thinking inclines more and more to the view that whatever individuals do not put into industry in some way will be provided, and workers are expecting increases in wages at the same time that they announce their intention of doing less work.

George E. Roberts, assistant to the president of the National City Bank, New York, said last week, in addressing the Iowa Bankers' Association:

If the workers in each industry set their aim on doing just as little work as possible, there will be less of everything for everybody. What we want is more of everything for everybody. The secret of social advancement is in increased production. We want thirty bushels of wheat to the acre instead of fifteen; seventy-two bushels of corn in Iowa instead of thirty-six, 300 pounds of butter fat to a cow instead of about 150, locomotives that will draw 100 cars to a train instead of fifty, machinery that will make ten yards of cloth where it now makes five, and so on all around the circle.

The theory of the day seems to be that each industry belongs to the particular people in it, without regard to the interests of the rest of the community. This is a theory which would divide society into warring groups.

and classes whose interests would be in conflict. The remedy for this is education in sound economic principles.

Developing the same thought, the *New York Sun*, in commenting on the report adopted by the American Federation of Labor at Atlantic City, has this on the proposal that the period of work be shortened from the eight-hour basis, the six-hour day being urged so as to take care of the unemployed:

Let it be set down that in the aggregate labor earns and pays its own wage. Nobody else pays it; nobody else can. Out of what labor in the aggregate produces, labor takes its own return. The more that labor produces, the more it can take. The less that labor produces, the less there is for it to take. Labor, then, must impoverish itself if it so delimits its hours of work or so slackens its speed or otherwise so falls short of achieving adequate results that there is not enough production by labor to support labor as labor needs to be supported.

There is no class issue in the observations quoted above; merely the restatement and reillustration of economic principles which no amount of assertion of the coming in of a new era can do away with. The rewards of labor can no more be increased and the cost of living can no more be reduced by cutting down the amount of work done than can a business be expanded by withdrawing from it capital needed to carry it on. What would become of industry if labor and capital should set out to compete in the steady reduction of the contribution of each to the joint product?

The Research Movement

An appetite for research has seized the country. The investigating spirit has long been limited chiefly to ultra-scientific circles, and those who appreciated its importance were a not much larger circle. Now the necessity for thorough research is understood by workers of muscle as well as brain. Early in the war scientific achievement stood out prominently in the mental pictures of German successes. Later it was appreciated that Governmental and private and quasi-public agencies were at work here at home also coping with the special problems developed by the war. The lid of secrecy is being slowly lifted and an abundance of literature covering experiments and tests marks the present period of industrial advance. A conspicuous feature of recent engineering society meetings has been the large percentage of contributions which go to build up or develop theories, as distinguished from those dealing solely with matters of design.

The nation as a whole wants as good facilities for the common advantage in science and industry as we were wont to believe existed in Germany. It is not likely that the great fountainhead of information will be at the Capital, as was the case in Germany, for a movement has been gathering momentum here for some time for the establishment of a research laboratory in each industrial plant of any size. Opportunity for a free interchange is afforded by the technical societies and the technical

press, and an important agency will be found in the Engineering Foundation, now mainly a fund established by Ambrose Swasey and administered, as was expected, to further in part the collection of technological information. The war program through the Council for National Defense provided a useful organization, the National Research Council, from which we have been hearing, but now the demand is for substantial Government assistance. The American Society of Mechanical Engineers has asked for this and the American Federation of Labor has done likewise. Plainly the scientist is coming into his own, and the technical experts of our industries have reason to feel well satisfied with the outlook.

Japan as a Buyer of Steel

The phenomenal extent to which American trade with Japan in iron and steel expanded in war time is shown on another page. This expansion has been in many products but more particularly in steel plates and sheets, tin plate and machinery. In 1913 Japan took but 7250 gross tons of American steel plates and sheets, but in 1918 that country received 120,395 tons of steel plates and 53,862 tons of sheets, or 174,257 tons of both, twenty-four times the pre-war consumption. Still more striking was Japan's absorption of steel plates at the height of the war. In 1917, out of total exports of 525,660 tons of steel plates from the United States, Japan was credited with 257,709 tons, or about 50 per cent.

In tin plate and machinery the trade with Japan has also shown a marked increase. In 1913 Japan received from the United States only 227 tons of tin plate; in 1918 this had grown to 36,643 tons, or sixteen-fold. The export value of all metal-working machinery shipped from the United States in 1913 was \$15,558,212, and in 1918 it was \$51,620,297. Japan's share in 1913 is not recorded, but in 1918 her American purchases in this line amounted to over \$4,000,000. Japan's imports of rails were four times greater in 1918 than in 1913, and the use of cast and wrought pipe and fittings from 1916 to 1918 expanded over threefold.

In the non-ferrous field the increase in Japanese buying has been significant. In 1916 that country took from the United States only 149 tons of spelter; in 1918 the amount was 3378 tons. Only recently Japan has been an active buyer of copper as well as of spelter.

Already one nation is complaining that competition with Japan in markets in which the former was once predominant is almost impossible. Figures as to Japan's own steel output are conflicting, but it is plainly expanding. Japanese representatives in this country have already bought a number of electric steel furnaces, but some reports as to the use of such furnaces in Japan have been exaggerated. An interesting indication of the trend yonder, however, is that in the last eight months Japan's metal industries have bought over one hundred hardness testing instruments from one American maker. It may be noted also that in Japan there are 309 subscribers to THE IRON AGE, or

more than in any other foreign country apart from Canada.

Japanese development in steel will bear watching. It is not likely that the war time record of trade with this country will be maintained in peace times, but there should be no failure to cultivate so valuable a customer. Japan will be no mean factor in future world trade in steel.

Advancing Freight Rates

Taking account only of Class I roads, those with annual revenues above \$1,000,000, net operating income of the railroads fell below the Government guarantee or rental by \$214,000,000 in 1918, by \$176,000,000 in the first three months of this year, and by \$46,000,000 in April. The poorest results, therefore, occurred in the early months of this year. While April showed an improvement, with \$46,000,000 deficit, against a monthly average of \$59,000,000 in the three months preceding, there was no promise that the deficit would disappear as months passed, since the April deficit was 63 per cent of the guarantee, the net operating income for the month being only 37 per cent of one-twelfth of the annual rental.

Since the enactment of the original interstate commerce legislation in 1887, the right of the railroads to a fair return upon their investment has been recognized. The public incurred an additional obligation when the roads were taken over for Government operation as a war measure. Earnings were guaranteed for the period of Government control, and it was also provided that the roads should be returned in as good physical condition as when taken over. But there is also an obligation to allow the railroads to make such charges for their services as will offset their increased expense of operation. Railroad owners might, indeed, venture to lay claim to more than this. They might urge that owners of shares cannot buy as much with their dividends as formerly, hence dividends should be increased. Various commercial enterprises have this philosophy, and are deterred from issuing stock dividends because it is uncertain whether the issue would be taxed. Such claims, however, are not made on behalf of the railroads.

Only two arguments worthy of consideration have been put forward in favor of delaying the making of rate advances in order to furnish the railroads the necessary revenues when they are again operated by their owners. One is that increased income through increased traffic should be awaited, while the other is that freight rate advances would be passed on to the public with increments. Neither of these arguments is adequate.

The painful experiences before the war should readily be recalled, when rate cases lay pending for unconscionably long periods. If the principle once be recognized that an increased volume of traffic should be awaited before the rate question is taken up, no measuring stick could afterwards be used to determine when the proper time had arrived. The adoption of the theory throws the whole subject into confusion.

No principle should be adopted that cannot be precisely defined. It is a matter of a certain number of dollars with the railroads, and any principle

invoked to delay the necessary rate advances should be expressed with equal precision. If the general principle proposed is correct, that net operating income of railroads should be independent of the volume of traffic, that rates should be lower when there is more traffic, then they should be higher when there is less traffic. If so, they should be advanced at once, with the understanding that they would subsequently be reduced, if or when traffic increases. Stated in that form, the principle would be less enthusiastically defended by those who have proposed it.

The argument that there is danger of rate advances being passed on to the public with increments is equally unattractive. It has been asserted that the "cost of living" might be increased by two or three times the amount of the advances, so that the public would find it cheaper to pay the necessary taxes to make good the Government guarantee to the railroads than to meet the situation by paying higher freight rates. This was probably suggested by occasional instances that have occurred in the past, quite unrepresentative of conditions in general. In times when prices are well established, manufacturers and tradesmen might seek an excuse to advance prices, and a freight rate advance or an increase in taxes furnishes the excuse. Such a condition does not exist to-day. All prices have been shaken altogether loose from their moorings and excuses are not sought for advances. At best, however, the argument could apply to but a small part of the total freights that are paid. In a very large number of commodities, chiefly those that furnish the bulk of the freight revenue, sales prices are f.o.b. point of origin, the buyer paying the precise freight, no more and no less. That is the general case, for instance, with iron and steel prices, and in the main with coal prices also. To a slight extent some steel mills benefit by freight advances, but in such cases the tendency to cut prices is intensified. On the other hand, there are many cases where an advance in freight rates would be borne entirely by the seller and the cost of living would not be increased a particle. The argument is altogether unsound and should be combatted whenever encountered.

A Group Insurance Flaw

The practice of group insurance is becoming the common thing in industrial works and seems to have worked out with excellent results. But faults develop occasionally, usually not in the insurance policies but in the methods of the owners in applying the system among their workers. With group insurance the employer pays the premium, and the individual's policy lapses when employment ceases. Very often, however, it occurs that a man is laid off temporarily, with the understanding that he will be notified when his services are required again. It is in such periods that trouble may be met.

A case arose recently in one of the large wire mills. A workman's life was insured in a group of employees for \$200. Business became slack and he was laid off. His name remained on the insurance list, the company keeping up his policy. After a while business picked up and a letter was sent him, ordering him to report on the following Monday.

He failed to appear, and after 10 days his policy was permitted to lapse. He was no longer considered a member of the working force. Presently a representative of his estate appeared and claimed the face of the policy, and it developed that when the summons was sent the man was seriously ill and that he died four days after the insurance lapsed. As a matter of fact, the insurance company, when it learned the circumstances, waived its rights, accepted from the employer corporation the premium which would have been paid had the man remained on the list, and paid over the \$200. But this was an act of generosity rather than of business.

To remove the possibility of such cases a plan should be devised for keeping in touch with workers when they are not actually employed. If when a man is laid off temporarily he decides to give up his job the employer should know it immediately, not only that premiums on the insurance might be stopped, but that provision be made for filling the place should occasion demand. A man may accept other employment; he may change his address or go out of town; or he may be ill. Absentees should be required to report at stated intervals, in person or by letter or messenger. It should be impressed strongly upon employees that the life insurance the owners carry for them is a very important and tangible asset, safeguarding their dependents in case of the death of the breadwinner.

Marked Activity in the Youngstown District

Steel plants in the Youngstown, Ohio, district will be closed only Friday and Saturday this week, instead of the customary two weeks' closing for repairs at this time of the year. During the slack period in the steel trade, manufacturing plants in the Mahoning Valley took advantage of light operations to make needed repairs and betterments, so that the plants are now in good physical condition. The Youngstown Sheet & Tube Co. is operating all four of its blast furnaces at East Youngstown, and also its two Hubbard stacks at Hubbard, Ohio. Its Bessemer and open hearth steel plants are running to 75 per cent, or better, and its finishing mills to about the same capacity. The Republic Iron & Steel Co. is operating all of its five blast furnaces at Haselton, but its Hall, Atlantic and Hannah blast furnaces are idle, these being small furnaces, and to some extent isolated, being operated by the company only when its needs for metal require. The Republic company is operating its Bessemer and open-hearth steel plants to 75 per cent, or better, of capacity, but its Deforrest sheet mill plant at Miles, Ohio, is idle, in order to allow an electric motor drive to be installed and some other slight improvements made. The Republic company is figuring on adding about 30 hot sheet mills to its Deforrest plant, and work on these may be started late in the year. The foundries and machine shops and other manufacturing plants in the Youngstown district, such as the Truscon Steel Co., Republic Rubber Co., and others, are running to nearly 100 per cent, with good orders ahead.

Implement Business Better

Better business in the fall is looked for in the farm implement business, according to the consensus of opinion as expressed in the meeting of the Farm Wagon Department of the National Implement and Vehicle Association in Chicago on June 18. There has been a noticeable increase in orders for immediate shipment as crops develop and an expanding demand is expected throughout the remainder of the summer and the fall months.

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"The Iron Age" and Its Readers

The demand for the diagram of steel manufacture by R. B. Woodworth, which THE IRON AGE has been sending to subscribers, has exceeded all expectation as to the United States, and now the distant parts of the earth are being heard from. For example, C. Y. Wang, mining engineer, Hankow, China, has sent for copies.

A more interesting bit of evidence of the international character of the subscription list of THE IRON AGE was furnished a few days ago when K. D. MacKenzie, director and general manager, and George West, chief engineer, of the Eclipse Iron & Steel Works, Glasgow, Scotland, called at this office armed with a copy of THE IRON AGE, brought from Scotland. This was to serve as a guide on their trip to important manufacturing centers to get in touch with manufacturers, partly to obtain information as to improvement of manufacturing processes and partly to place orders for machinery. They were particularly anxious to know whether they would be received in American plants without letters of introduction, and were assured that the name and reputation of their company would be a sufficient introduction.

Fewer Workers But Increased Wages

Conditions in the Iron and Steel Industry Compared With Those of Other Industries in the Early Part of the Year as Shown by Reports of Bureau of Labor Statistics

WASHINGTON, July 1.—Conditions in the iron and steel industry, which in the slack period this spring showed increased total labor costs over last year even though fewer workmen were on the payrolls, are reflected in the reports of the Bureau of Labor Statistics concerning the volume of employment in March, 1919. The comparisons in the iron and steel industry between March of this year and the same month of 1918 are based on figures obtained from 102 establishments. Data compiled from a dozen other classes of industries show that iron and steel ranks fourth among eight which had increases in labor costs. Without exception, each of the 13 industries reported fewer employees.

In March of this year, the number on the payrolls in the iron and steel industry totaled 166,897, as against 182,872 in March, 1918. This was a decrease of 8.7 per cent. Notwithstanding this decrease in the number employed, wages had been advanced to such an extent during the year that the semi-monthly payroll in March of this year totaled \$11,239,659, as against \$9,555,253 last year at the same time. This was an increase of 17.6 per cent in the total, the percentage of increase in individual wages being much greater.

That this situation led to some cuts in wages during the period between Feb. 15 and March 15 of this year is shown by answers to direct inquiries along this line.

Decreases Reported

On the subject of changes in wages in the iron and steel industry during that month, the report says:

"A decrease of 17½ per cent affecting 40 per cent of the force was made in one plant; and a 17 per cent decrease was reported by another plant, but no information was given as to the number of employees affected. Decreases of 10 per cent went into effect in three establishments and affected 40 per cent of the men in one, 25 per cent in another, but the third plant failed to give any further data, while approximately 68½ and 40 per cent of the employees were decreased 10 per cent in two other plants.

"Seven establishments made decreases ranging from 5 to 9 per cent, affecting 37½ per cent of the employees in one plant, the tonnage men in another, about 1 per cent of the employees in the third, and 33 1/3 per cent of the force in the fourth, while the decrease in the remaining establishments affected 20 per cent of the men in one, 50 per cent in another, and 66 2/3 per cent of the employees in the seventh establishment. The tonnage men in the concern were decreased, but no data was given as to the per cent of decrease or the number of men affected."

Among nine classes of industry from which reports were received relative to changes in wages following the signing of the armistice, the steel and cotton industries were the only two reporting decreases. The others, automobile manufacturing, boots and shoes, cigar manufacturing, men's ready-made clothing, cotton finishing, paper-making and silk manufacturing, all reported increases.

Compared with Other Industries

In the tabulation showing comparisons between March of this year and March, 1918, relative to the number employed and payroll total, there are several industries which appear to have reduced their forces by a larger percentage than iron and steel.

The industries reporting the largest increase in the total amount of the payroll in March of this year over March, 1918, are car building and repairing, leather manufacturing, automobile manufacturing, and iron

and steel, with 27.7, 22.9, 21.1, and 17.6 per cent respectively.

A comparison of employment between March and February, both of this year, shows that out of the 13 classes of industries, iron and steel slumped the most. Its working force was reduced from 170,585 to 165,950, or 2.7 per cent, while the amount of the payroll fell off from \$11,773,656 to \$11,143,225, or 5.4 per cent, the larger per cent being accounted for apparently by cuts in war-time wage scales during the month.

The industries which were on the upgrade during the month were woolen, with 31.2 per cent increase in working force and 37.8 per cent in amount of payroll, silk with 11.1 and 21.6 per cent increases, cotton finishing with 2.7 and 5.3 per cent increases, automobile manufacturing with 2.6 and 1.7 per cent increases, leather manufacturing with 1.8 and 2.8 per cent increases, men's ready-made clothing with 1.4 and 4.2 per cent increases, and cigar manufacturing with 0.3 and 4.4 per cent increases. Industries which like iron and steel sustained a falling off of business were boots and shoes, car building and manufacturing, hosiery and underwear and paper making.

Hours of Work and Output

In a report issued June 30 by the National Industrial Conference Board the conclusion is reached that in the metal manufacturing industries it is possible for "a considerable proportion of establishments to maintain production on a schedule of 50 hr. per week," but that such a schedule "could not be universally adopted by these industries without some loss in production."

In the case of a 48-hr. week, a smaller proportion of establishments reported production as maintained, and several of these, because of unusual size, exacting nature of the work, or other reasons, were not representative organizations. Notwithstanding the fact that reductions to such a week proved satisfactory from a production standpoint "in a sufficient number of cases to invest such a schedule with a high degree of interest," the report holds that "the weight of the evidence leaves little ground for doubt that a general reduction to a 48-hr. week at the present time would mean a serious loss in production."

"The amount of handwork as contrasted with automatic-machine work exerts an important influence on output. In establishments where a very large percentage of the work is performed by highly automatic machinery the evidence indicates that in general maximum production cannot be had on a schedule as low as 48 or 50 hr. per week."

The investigation developed no significant change in the health of metal workers resulting from reductions in work hours. The tuberculosis death rate in certain branches of metal manufacturing industries, as for many other indoor occupations, is high. It is notably high among brass workers. On the whole, however, the report finds that health conditions among workers in the metal manufacturing industries are relatively favorable, judged by the average hazards of industrial employment.

The report points out that distinction should be made between what can be done on a 50-hr. schedule and what, as a practical matter, will be done. Much depends upon the degree of co-operation secured between the management and its workers. If full co-operation to attain the highest reasonable efficiency could be secured there can be little doubt that a 50-hr. week could be very generally adopted in the metal trades without serious disadvantage. "No single factor," says the report, "could do more to accomplish this result than the recog-

dition by workers of the indisputable principle that their real interest and that their real opportunity for bettering their condition lies in increasing the efficiency of individual production.

"If both management and workers would actively co-operate to this end, moreover, a 48-hr. week might prove practicable in a larger number of establishments than is now the case. But unless such co-operation is secured there can be little question that the general adoption of a 48-hr. week in the metal trades would involve a serious economic loss to the nation."

The report includes the metal trades proper, foundries, automobile, hardware, electrical equipment, and some miscellaneous establishments.

In the course of the investigation two questionnaires were sent out, one in the latter part of 1917, the second in March, 1919. Replies were received from 1247 establishments employing 755,534 workers. Of these, 409 establishments, employing 361,371 workers, had reduced hours and furnished data as to the effects of such reductions.

The evidence furnished by the two questionnaires for the 50-hr. and 48-hr. groups, in which as a practical matter interest chiefly centers, is summarized as follows:

Effect on Output—48-hr. Group

	1917		1919	
	Estab-lishments in group	Per cent of total employees in group	Estab-lishments in group	Per cent of total employees in group
Increased	5	67.1*	1	8.4
Maintained	13	16.4	4	2.6
Decrease, less than proportional	4	2.9	9	32.2
Decrease, about proportional	10	9.4	14	40.7
Decrease, greater than proportional	1	.5	3	1.4
Decrease, amount not stated	8	3.7	9	14.7
Totals	41	100.0	40	100.0

*Over 60 per cent of employees in the 48-hr. group were in two establishments.

Effect on Output—50-hr. Group

	1917		1919	
	Estab-lishments in group	Per cent of total employees in group	Estab-lishments in group	Per cent of total employees in group
Increased	4	4.9	2	8.6
Maintained	28	47.8	9	11.9
Decrease, less than proportional	12	28.4	9	42.6
Decrease, about proportional	10	9.7	7	10.6
Decrease, greater than proportional	2	3.4	1	1.6
Decrease, amount not stated	10	5.8	7	24.7
Totals	66	100.0	35	100.0

In the case of the 48-hr. group covered by the 1917 returns, the establishments reporting an increase in production had more than two-thirds of the total number of workers. However, one of the establishments increasing production was exceptionally large, which gives a disproportionate weight to the "increased" group from the standpoint of numbers employed. It is, nevertheless, significant, that 46 other establishments, none of which were of unusual size, reported either an increased or a maintained output under such a schedule.

Unemployment Declines

Fourteen community boards in Connecticut reported last week to Federal Director David Elder of the U. S. Employment Service that unemployment was at the lowest ebb since the signing of the armistice. The number of jobless persons was given as 5,475, or a shrinkage of 1,300 from the week previous, and this in spite of the reduction by Marlin-Rockwell Corporation at its New Haven plant of some 600 employees. On the other hand, the request from New Britain and Bristol for 200 workers is still unsatisfied and in a single issue of a recent Bridgeport newspaper there were counted 30 help-wanted advertisements of factory type.

In the World of Labor

Companies which have recently provided for group insurance for their employees with the Travelers Insurance Co., Hartford, Conn. are Billings & Spencer Co., high grade tools, Hartford; the Chase companies of Waterbury, Conn.; the Corona Typewriter Co., Gorton, N. Y.; Chapman Valve Mfg. Co., Indian Orchard, Mass.; Doehler Die Casting Co., Brooklyn, N. Y. The insurance is written without medical examination, usually at the expense of the employer. Upon the years of service depends the size of the employee's policy, the maximum ranging from \$1500 to \$2000. Four years ago group insurance was practically unknown.

Life insurance has been taken out by the Central Iron & Steel Co., Harrisburg, Pa., for each of its employees. The insurance commences with amounts ranging from \$500 for those who have been in the service six months to \$1,000 for those who have been employed five years, increasing thereafter at the rate of \$100 per year until the maximum of \$1,500 is reached. In the event of permanent total disability before reaching the age of 60 years, each employee is entitled to all accumulated insurance. The company bears the entire cost of insurance, which does not affect the amount to which employees may be entitled under the Pennsylvania workmen's compensation act. Robert H. Irons, president, made the announcement of the insurance plan last week.

The Dominion Sheet Metal Corporation, Hamilton, Ont., has inaugurated a profit-sharing scheme for employees. Eight per cent preferred stock will be offered to the employees, the number of shares to be based upon earnings. The offer will be made at par, although the stock has been selling at from 110 to 112 in a limited way. The employees are to pay for the stock at the rate of 2 per cent per month. They will be credited with the 8 per cent dividend, at the rate of 2 per cent each quarter, and no charge will be made for interest or unpaid balances. The arrangement means 14 per cent annual credit and no interest charge.

At a meeting of the executive committee of the Chicago Foundrymen's Association on June 18, a new constitution was recommended for adoption which provides for admitting to membership any "manufacturer of metallic casting goods," regardless of whether he elects to operate a union or open shop. The two classes of members will be grouped into two departments for consideration of matters pertaining to labor and employment, but will be associated together in studying matters pertaining to business betterment. Heretofore the association has been a closed shop organization.

The strike of patternmakers at the plant of the Chapman Valve Mfg. Co., Indian Orchard, Mass., was amicably settled last week. A quarter-of-an-hour conference with A. W. Gilbert, president and general manager, developed that the walk-out of men was due to a misunderstanding and they returned to work with the same wages and other conditions as on the date they left the plant, June 18.

Plants of the Carnegie Steel Co. in the Youngstown district are employing 500 more men than at the signing of the armistice. All returned soldiers who desired their old positions back were given them, and employees replaced were either offered other positions or sought positions elsewhere.

Governor Calvin Coolidge, of Massachusetts, signed on June 26 the bill requiring that preference be given to war veterans in the employment of mechanics, teamsters and laborers on public works. The bill provides a penalty of \$100 fine for any violation of the enactment.

Founders and molders at Hamilton, Ohio, have agreed on an 8½-hr. schedule at \$5.60 per day until Sept. 1, and eight hours at \$6 from Sept. 1, 1919, to April 1, 1920.

TO HELP FOREIGN TRADE

Shipping Board Quotes Special Rate on South African Shipments

WASHINGTON, July 1.—Negotiations pending with the Shipping Board are expected to mark a step in advance in the development of foreign trade with the aid of an American merchant marine. The proposition involves a large shipment of locomotives, cars, rails and other railroad equipment to South Africa for the use of the South African Government in rehabilitating the railroads of that country.

The South African Commission, with headquarters in London, already has contracted for a considerable quantity of material from American manufacturers, including 30 locomotives from the Baldwin Locomotive Works, and others from other companies.

Whether vessels of the United States Shipping Board or British ships will carry the shipment is in process of negotiation. The Shipping Board has quoted a special rate in order to get the business. If the rate isn't low enough, British ships will get it.

Not only is the board anxious for the business on its own account, but it has in view aiding American manufacturers in developing a market in South Africa. While the contracts already made involve a price at the American plants, the South African Government paying the freight, a low enough freight rate holds out a promise of additional business for the American manufacturers in future.

Much of the material will be ready for shipment next month. The Shipping Board is prepared to allocate enough ships to this route to carry the cargo promptly. Ships have been maintained on the South African route for several weeks by the Shipping Board, but not with sufficient capacity for this shipment.

This move on the part of the Shipping Board may be an opening wedge which will make possible a general policy of material advantage to American manufacturers. While it is the avowed purpose of the Shipping Board as specifically set forth in the act creating the board to encourage and promote foreign trade and the development of markets for American manufacturers, yet up to date, comparatively little has been done in this direction. During the war the shortage of shipping was so acute that ordinary commerce was prohibited. Since the signing of the armistice ships have been assigned to trade routes as rapidly as possible by the Shipping Board, but rates, although materially reduced, have remained high compared with pre-war levels. The rates have represented a handsome profit to the Shipping Board.

Officials of the Shipping Board have taken the position that they would not be justified in operating the ships at an actual loss. It is believed that even the low rates quoted for the South African Government do not represent a loss, although considerably below the usual scale.

Secretary of Commerce Redfield has disagreed with the Shipping Board's policy contending that the board should even operate at a loss at times, if such action would enable American manufacturers to gain a foothold in a new market. It is his theory that not only the manufacturers but the board itself later would profit from the business that would be built up. The Shipping Board act was drafted in the Department of Commerce and Mr. Redfield believes he construes the meaning of the act correctly in the light of the intention of its framers.

Mr. Redfield has taken issue both with the Shipping Board and the Railroad Administration on this point, the latter also going on the theory that the business should be conducted on a profit-making basis if possible. The Railroad Administration has lost money, but it has not done so deliberately.

Operating profits of the Shipping Board are kept a secret, the Senate Commerce Committee recently having allowed J. H. Rosseter, director of operations to testify regarding profits in executive session, in order that foreign governments might not obtain possession

of the board's operating cost figures. It has been stated during the consideration of an appropriation for the Shipping Board that its operating revenue during the coming fiscal year would total probably \$60,000,000.

Iron and Steel for Dutch East Indies

The Government of the Netherlands, Colonial Department, has been purchasing considerable iron and steel for the State railroads in the Dutch East Indies, particularly Java and Sumatra, through its purchasing office at 17 Battery Place, New York. Monday it placed orders for 800 tons of steel forgings in the form of 5-in. rounds with machined ends, 100 tons of railroad springs and spring steel and 5 tons of hard-drawn copper wire. By the middle of this week it will have placed orders for 700 tons of tie plates. Inquiries are expected this week for from 1500 to 1800 tons of mild steel bars.

There is now being shipped 23,000 tons of bars, plates, structural shapes and galvanized sheets; also 8000 tons of rails purchased from the United States Steel Corporation. On June 15 an order for 800 steel mine cars with spare parts was placed with the Atlas Car & Mfg. Co., Cleveland. These cars will be used for mining tin, one-half the world's supply of this metal coming from the Dutch East Indies.

During the last two months all iron and steel products imported into the Dutch East Indies have come from the United States through the New York office and prospects for future dealings on a larger scale seem better. For materials shipped from a point east of Chicago the cheapest route is to New York by rail, thence by boat through the Panama Canal to the Dutch East Indies. From points west of Chicago products travel via rail to San Francisco and thence by the Pacific Ocean direct. Where there is need for especially prompt delivery shipping is made from eastern points direct to San Francisco as Pacific Coast boats are more available in the opinion of the New York office of the Colonial Department.

Ocean Freight Rates on Coke

WASHINGTON, July 1.—Ocean freight rates on coke are quoted by the Shipping Board for the first time in a new tariff just issued. The rates apply to shipments from North Atlantic ports and from Charleston, S. C., to European points. The tariff also contains revised rates on coal.

The coke rates are 50 per cent higher than those on coal to the same points.

Better shipping conditions are shown by an order of the War Trade Board permitting coal to be shipped from any port, the congestion at the Northern ports making necessary a rule previously requiring coal to be shipped from Southern ports only.

Steel Barges Launched

WASHINGTON, July 1.—The first of the new steel cargo barges constructed for the Railroad Administration for service on the Lower Mississippi River between St. Louis and New Orleans was launched by the American Bridge Co. of Pittsburgh on June 26. The Railroad Administration has been advised that the American Bridge Co. expects to launch one barge every two weeks. This company is building 25 of these barges while the Drave Contracting Co. is constructing 15. They will be delivered ready for operation 30 days after the date of launching.

The Stockbridge Machine Co., the Reed-Prentice Co. and the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.; the Becker Milling Machine Co., Hyde Park, Mass., and the Giddings & Lewis Mfg. Co., Fond du Lac, Wis., manufacturers of machine tools, have combined in the establishment of an export selling office at 24 Stone Street, New York. L. S. Devos, until recently a member of the Air Service, American Expeditionary Forces, has charge of the office.

Phosphorus and Sulphur Limits Restored

Testing Engineers Remove War-Time Tolerance from 29 Specifications and Retain It in 14—Papers on Magnetic Analysis a Noteworthy Feature

The 1919 meeting of the American Society for Testing Materials, held at Atlantic City, June 24-27, was interesting from the standpoint of steel metallurgy for three discussions, and in the way of legislation for the action taken on phosphorus and sulphur limits in various specifications covering steel products. The three discussions were those relating to defects disclosed by "Deep Etching of Rails and Forgings," to "Modern High Speed Steel" and to magnetic analysis for the detection of flaws in steel or for determining broadly its quality. The extent to which work in magnetic analysis has been carried was a revelation to many in attendance. The uniformity in the physical characteristics of malleable castings which can now be counted on was also one of the facts brought out by the meeting.

The war-time addition of 0.01 per cent to the tolerance in respect to phosphorus and sulphur was suspended (as of July 1) in the case of 29 specifications for steel, and was continued in respect to 14 specifications. The producers, on most of their deliveries, have met the old requirements as to phosphorus and sulphur, but in spite of continued handicaps in their raw materials.

If there was any expectation of heated discussion on the convention floor over the retention of the higher phosphorus and sulphur ranges, it was disappointed. The recent sessions of committee A-1 on steel, however, brought out some strenuous protests from users of steel against the continuance of the tolerance belonging to war-time.

The attendance made a new record, reaching 613 at the end of the third day, with indications that fully 650 would be reached in the final meeting of the cement section, as against a total of 583 in 1918.

Phosphorus and Sulphur Limits

From the standpoint of producers and manufacturing consumers of steel the most important action taken by the convention was the decision to remove from 29 specifications for various forms of finished steel what is known as the phosphorus and sulphur note, added by action of the society at the meeting of 1918. This note read as follows:

In view of the abnormal difficulty in obtaining materials in time of war, the rejection limits for sulphur in all steels and for phosphorus in acid steels shall be raised 0.01 per cent above the values given in these specifications. This shall be effective during the period of the war and until otherwise ordered by the society.

The reason for modifying the phosphorus and sulphur requirements last year was the abnormal difficulty in obtaining materials in war-time that would meet the specific requirements of the society's standards, particularly in view of the high sulphur content of coal and coke in war time. In his report as chairman of Committee A-1, on steel, presented on Wednesday, J. A. Capp said that in the meetings of the committee arguments had been presented by the producers of steel showing that the conditions, particularly as to the high sulphur content of coal and coke have not become normal and are likely to continue for some time. Fuel has not been as carefully prepared as before, and therefore sulphur runs higher in both coal and coke. The effort of the Government to increase the output of the by-products of coke ovens had compelled a large use of by-product coke and consequently an increasing use of coke-oven gas in steel making, causing a greater liability to higher sulphur in the steel.

Important Investigation on Effects of Sulphur and Phosphorus on Steel

The discussion in the committee's sessions on the effects of phosphorus and sulphur on steel brought out strongly the need of up-to-date information on the subject. More recently a diversity of opinion had been expressed on the effects of sulphur. The committee proposed to arrange a program for a highly scientific investigation of the effects of phosphorus and sulphur on steel. The Bureau of Standards has expressed a willingness to undertake the investigation. When it is completed it is hoped that it will be possible to say to what degree phosphorus and sulphur may be present in steel without detrimental effect.

The final vote in the committee on the removal of the phosphorus and sulphur note showed a great pre-

ponderance in favor of the retention of the note in specifications relating to acid steels. In one or two cases the opposition to the retention of the note was marked, however. The vote on retaining it in respect to phosphorus in Bessemer steel rails was 17 ayes and 8 nays.

Lower Limits Restored

The following are the specifications from which the convention voted on the recommendation of Committee A-1 to remove the note:

- A2-12. Open-hearth steel girder and high tee rails.
- A4-14. Medium-carbon steel splice bars.
- A5-14. High-carbon-steel splice bars.
- A6-14. Extra-high-carbon-steel splice bars.
- A7-16. Structural steel for bridges.
- A8-16. Structural nickel steel.
- A14-16. Carbon-steel bars for railway springs.
- A17-18. Carbon-steel and alloy-steel blooms, billets, and slabs for forgings.
- A18-18. Carbon-steel and alloy-steel forgings.
- A19-18. Quenched and tempered carbon-steel axles, shafts and other forgings for locomotives and cars.
- A20-16. Carbon-steel forgings for locomotives.
- A21-18. Carbon-steel car and tender axles.
- A22-16. Cold-rolled steel axles.
- A25-16. Wrought solid carbon-steel wheels for electric railway service.
- A26-16. Steel tires.
- A29-18. Automobile carbon and alloy steels.
- A32-14. Cold-drawn Bessemer steel automatic screw stock.
- A49-15. Quenched high-carbon-steel splice bars.
- A50-16. Quenched carbon-steel track bolts.
- A51-16. Quenched alloy-steel track bolts.
- A54-15. Cold-drawn open-hearth steel automatic screw stock.
- A57-16. Wrought solid carbon-steel wheels for steam railway service.
- A58-16. Carbon-steel bars for vehicle and automobile springs.
- A59-16. Silico-manganese-steel bars for automobile and railway springs.
- A60-16. Chrome-vanadium-steel bars for automobile and railway springs.
- A63-18. Quenched and tempered alloy-steel axles, shafts and other forgings for locomotives and cars.
- A68-18. Carbon-steel bars for railway springs with special silicon requirements.
- A70-18T. Boiler and firebox steel for stationary service.
- A71-17T. Carbon tool steel.

Higher Limits Continued

In the following 14 specifications the note increasing the phosphorus and sulphur limit by 0.01 per cent

is retained, in accordance with the recommendation of the committee:

- A1-14. Carbon-steel rails.
- A3-14. Low-carbon-steel splice bars.
- A9-16. Structural steel for buildings.
- A10-16. Structural steel for locomotives.
- A11-16. Structural steel for cars.
- A12-16. Structural steel for ships.
- A13-14. Rivet steel for ships.
- A15-14. Billet-steel concrete reinforcement bars.
- A27-16. Steel castings.
- A28-18. Lap-welded and seamless steel boiler tubes for locomotives.
- A52-18. Lap-welded and seamless steel and wrought-iron boiler tubes for stationary service.
- A56-18. Iron and steel chain.
- A67-18T. Steel tie plates.
- A76-18T. Low-carbon steel track bolts.

Revised Specifications

The report of Committee A-1, on steel, covering its activities in the past year, made two recommendations concerning standards and both were adopted. The first was that the proposed revision of the standard specifications for open-hearth steel girder and high tee rails (A2-12) be published as tentative. The feature of the revision is the replacing of the present drop test requirements by a ball impression test. The second was that a new specification for plates for forge welding be published as tentative. This specification is based on information obtained from the tank car committee of the Master Car Builders' Association, from the railroad companies which use tank cars, and from leading manufacturers engaged in fabrication of tanks for cars by the forge welding process. The analysis provided in the proposed specification limits carbon to a maximum of 0.18 per cent, phosphorus to 0.04 per cent, and sulphur to 0.05 per cent. The manganese range is 0.30 to 0.60 per cent. The minimum tensile strength for plates $\frac{3}{4}$ in. or under is 48,000 lb. per sq. in., and for plates over $\frac{3}{4}$ in. is 45,000 lb. per sq. in. The yield point is put at one-half the tensile strength. The present elongation in 8 in. is 1,500,000 divided by tensile strength. Modifications in elongation are made in proportion to the thickness. Tables are given of permissible variations of plates ordered to weight and the permissible overweight of plates ordered to thickness.

The committee recommended that the question of specifications for aircraft steels be worked out in co-operation with the Society of Automotive Engineers and negotiations for a joint committee are now in progress.

Five Tentative Specifications

The committee recommended, and the society so voted, that the proposed specifications for steel tie plates, boiler and firebox steel for stationary service, carbon tool steel, low carbon steel track bolts and electric cast-steel anchor chain be continued as tentative for another year without revision.

The committee will consider in the coming year the revision of the specifications for carbon steel rails, and on its recommendation the executive committee is negotiating for co-operation with the A. R. E. A. rail committee. In the coming year consideration will be given to the advisability of preparing a new table of permissible variations in ship plates ordered to weight per square foot. A revision of the standard specifications for steel castings by which annealing lugs will be required on all important castings to aid in judging of the quality of annealing is under consideration.

Standards for High Speed Steel

Some revisions of the present tentative specifications for carbon tool steel are under consideration, also the preparation of specifications for high speed tool steel, though considerable preliminary study and discussion of the latter subject are needed. The committee's ladle test ingot investigations have not been completed because of war conditions. A report of progress contains a summary of the metallographic examination of medial and transverse sections and the chemical examination of medial sections of four sets of ladle test

ingots poured in five typical shapes of molds representing present practice.

The committee is to co-operate with committee B-2 on non-ferrous metal and alloys in preparing specifications for aluminum shot for use in open-hearth steel practice.

Fatigue Tests of Nickel Steel and Chrome-Nickel Steel

A paper by H. F. Moore and Arthur G. Gehrig gave results of a series of tests made in the materials testing laboratory of the University of Illinois, as an introductory study of the effect of heat treatment on fatigue resisting strength of steel. The nickel steel was of about 3.3 per cent nickel content and the chrome-nickel steel contained about 0.8 per cent chromium and 1.3 per cent nickel. Both static tension tests and tests under reversed bending stresses were made of annealed material, of heat-treated material, and of specimens with polished surface. The tests indicate that the results of a static tension test are not a reliable index of fatigue strength of a material under oft-repeated low stresses, and that high-stress, short-time fatigue tests do not give a reliable index of fatigue strength under oft-repeated low stresses. The results indicate also that a heat treatment may raise the elastic strength of a steel without increasing its fatigue resistance under low stresses. The tests indicate further that perfection of surface finish is an important factor in determining fatigue resistance under oft-repeated low stresses.

Mr. Moore, in answer to an inquiry, said that the paper does not assert that heat treatment will not increase endurance, but that in the particular case described it did not do so.

Magnetic Analysis for Determining Quality

Magnetic analysis as a method of testing ferrous material for quality received special attention at the Wednesday evening session. An increasing number are devoting themselves to the subject, owing to the promise that the method affords of meeting the demand for a scheme of testing that does not require destruction of a specimen; in other words, instead of studying a selected sample, it is desired that the method may be applied to the material which is actually to enter into use.

A group of five papers was presented, covering practical applications and also future possibilities. The first introductory in nature was contributed by Dr. Charles W. Burrows, consulting engineer, formerly of the Bureau of Standards, and Frank P. Fahy, New York. What may be called the practical applications were comprised in a paper by Dr. P. H. Dudley, describing magnetic surveys of rails for the New York Central Railroad, in a paper on testing ball-bearing races under the joint authorship of R. C. Sanford and M. F. Fischer, and in a paper on rifle barrel steel by Mr. Sanford and W. B. Kouwenhoven. Magnetic properties as affording a basis for determining microstructure were discussed by C. Nussbaum. A written discussion directed at the rail paper was contributed by Dr. J. C. Unger, research bureau Carnegie Steel Co., and monographs on the general subject of magnetic analysis were presented by Prof. S. R. Williams, Oberlin College, and N. J. Gebert, metallurgical department Holz & Co., New York.

Two generalizations were made by Messrs. Burrows and Fahy: That the principle that there is a very close relationship between the magnetic and the mechanical characteristics of steel is established on a firm basis; that laboratory tests show that the commercial application of magnetic analysis to shop routine practice is practicable. They pointed out that magnetic analysis may be applied to the study of the effects of heat and mechanical treatments and of the changes that occur during or as a result of alternating, repeated or continued stresses; that it may be used to detect the presence of flaws in raw material or in the finished product; that it may be used, at least in part, as a

method for testing high-grade steel products, such as cutlery, tools, springs, rails, automobile parts, etc. They agree that certain shapes are difficult to test and that more data on the correlation of the magnetic and mechanical properties of steel are still required.

Magnetic Rail Testing

Dr. Dudley, whose paper was presented by his as-

forms the top and closing member of the yoke. The energizing or magnetizing solenoid travels along the test rail at a uniform rate, and is driven by a motor mounted above, and direct geared to the brass drive roller. Search coils are concealed within the solenoid shell for the detection of variations in the permeability of both the rail head and base, and are separately connected to the galvanometer circuit.

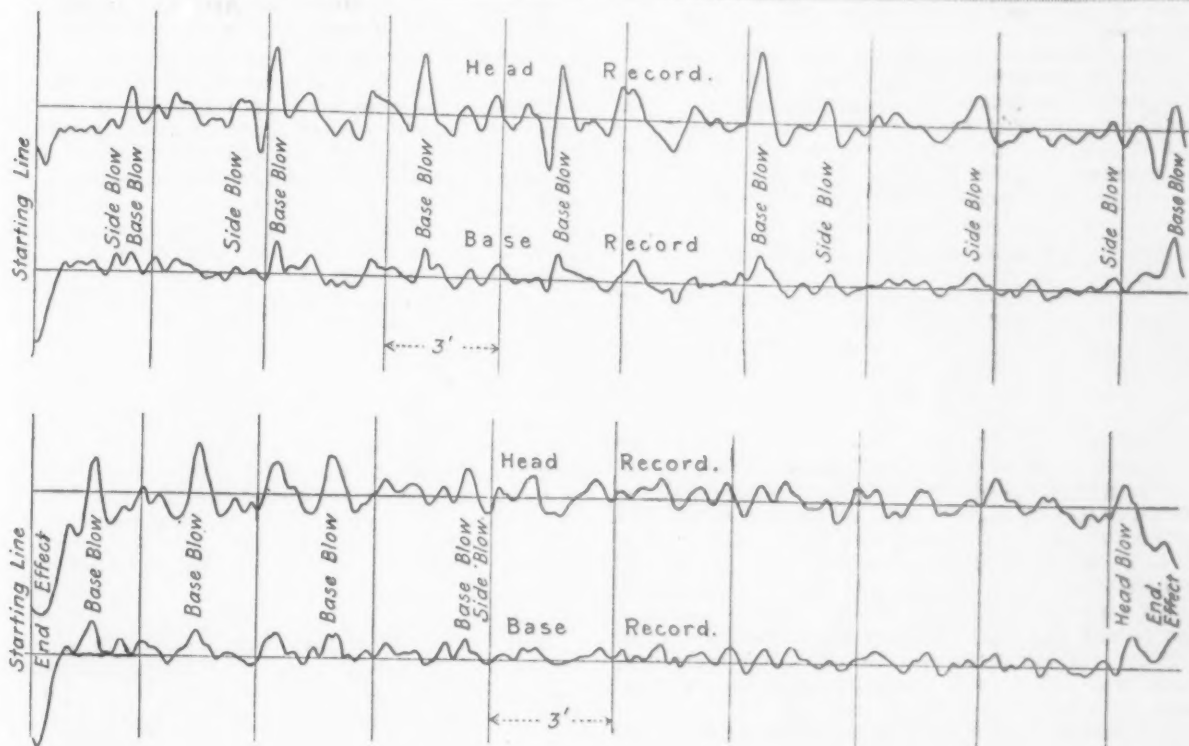
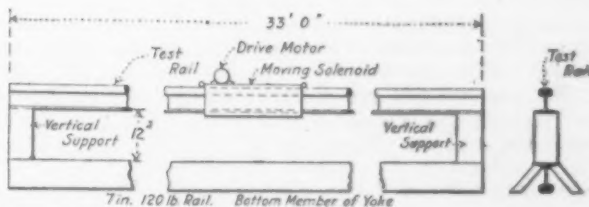


Diagram of Apparatus Used by Dr. Dudley for Making Magnetic Surveys of Rails and Some of the Leakage Curves. The upper pair covers a 6-in. 105-lb. new rail in which the straightening press supports in the gagging operation had a 42-in. span; in the case of the lower pair, the straightening press supports had a 60-in. span



sistant, C. B. Bronson, described how magnetic surveys of rails confirmed inhomogeneity of the interior metal of rail heads found by physical tests. Holding to his contention of some years that injuries of the interior metal are caused by the gag applied in the rail mills to straighten the rails, he showed magnetic leakage curves of rail tests to point out that there is a marked reduction in magnetic disturbance when there is a 60-in. span for the supports in the gagging press than when the span is 42 in.

He also took occasion to point out an experience with rails rolled from reheated blooms as compared with those rolled direct from the ingots. "Eight railroad companies," he said, "under heavy traffic reported from their service records 322,593 tons of rails from reheated blooms in which only 59 induced interior transverse fissures developed in the rail heads. Their records also included 559,644 tons of rails by direct rolling in which 1054 induced interior transverse fissures developed, an increase of 900 per cent over those in rails from the reheated blooms. These rails were rolled in 1909 to 1915 inclusive, while the records of fissures were to October, 1918."

The accompanying diagram illustrates the apparatus for making a magnetic survey of rails. It consists of a bottom supporting member, which is a 33-ft. rail turned base up; two sections of rail 12-in. high which act as vertical supports; and the test rail which

Following are some data on the equipment and its characteristics:

Dimensions of solenoid, 6 by 6 by 24 in. long.
Magnetizing force 10,000 ampere turns.
Voltage 60 volts.
Current 4.72 amperes.
Total number of turns 2,120.
Length of winding 4,840 ft.
Size of wire No. 13 D. C. C.
Batteries Willard, 5 crates of 6 cells each.
Drive motor Eck, 1/6 h.p.
Galvanometer Leeds & Northrup—Type R. No. 2500.
Search coil 50 turns of No. 30 D. C. C.

"We have made numerous complete surveys on rails in 25 min.," said Dr. Dudley, "one-half of the time being required for handling the rail on and off the vertical supports. The records obtained," he continued, "show that the greatest oscillations occur where the overloading and overstraining action of gagging was greatest. The degree of magnitude of the magnetic disturbances is an indication of the degree of the physical disturbance, for the two disturbances are correlated. There is a marked similarity between the curves for the head and base, which is accounted for by the fact that the disturbing action of straightening is transmitted through the entire rail section. The oscillations in the base record are consistently lower than those recorded for the head. This is true whether the blow on the rail during straightening was imparted in

the head or base. The difference in the magnitude of the oscillations is accounted for largely by the dissimilarity in shape of the rail head and base, also the shape of the two search coils, and furthermore by the fact that the metal of the base is of a more uniform and finer texture than that in the head."

Dr. Unger held that the discussions presented do not show that where magnetic disturbances exist, the material is unfit for service. If gagging of rails be the cause of transverse fissures and the gagged points can be located by magnetic testing, all rails, he said, should fail at such points, as all are gagged. This does not explain, he continued, why some transverse fissures occur at the ends of rails that are not gagged. A simpler method to determine the gagged point, he suggested, would be to examine the broken scale on the side of the rail. He added that magnetic testing had not reached the point at which it will show that injurious or destructive influences are at work.

Copper Bearing Sheets

The matter of corrosion of sheets came in for some discussion and proved that the controversial side of the question is still prominent. The subject was introduced by the report of committee A-5, on corrosion of iron and steel, presented by committee chairman S. S. Voorhees, Bureau of Standards, at the Wednesday evening session. This report pointed out that five groups of low-copper sheet metals exposed to the weather at Pittsburgh had failed. Somewhat in the nature of nullifying information were results of tests contributed in a paper presented immediately following the report by D. M. Buck, metallurgical engineer, American Sheet & Tin Plate Co., Pittsburgh. A discussion ensued, in which a prominent part was taken by Dr. Allerton S. Cushman, who among other things is a consulting expert for the American Rolling Mill Co., Middletown, Ohio, maker of ingot iron, an open-hearth product low in carbon.

The composition of the sheets, which were exposed by the committee on Dec. 12, 1916, and inspected four times since, the last time April 1, 1919, is shown in the accompanying table. The location was selected as calculated to give the conditions of an inland industrial center. The sheets being "complete failures" no further detail records are to be given by the committee, but tests of sheets exposed at Annapolis, Md., and Fort Sheridan, Ill., are still running.

Compositions of Sheets Which Failed in Pittsburgh Atmosphere

Type Designation	Carbon, per cent.	Manganese, per cent.	Phosphorus, per cent.	Sulphur, per cent.	Silicon, per cent.	Copper, per cent.
No. 22 gage Bessemer steel, series A.....	0.037	0.38	0.089	0.040	0.006	0.010
No. 22 gage low-copper pure iron series A.....	0.024	0.026	0.003	0.020	0.004	0.022
No. 22 gage low-copper open-hearth steel, series A.....	0.134	0.55	0.008	0.029	0.24	0.018
No. 22 gage low-copper pure iron, series B, American Rolling Mill Co.....	0.018	0.018	0.005	0.025	0.004	0.023
No. 22 gage low-copper pure iron, series B, Inland Steel Co.....	0.021	0.057	0.006	0.031	0.002	0.025

Mr. Buck in previous work had indicated that copper in steel in amounts heretofore considered as only traces materially influences the corrosion rate. To obtain further information, two heats of basic open-hearth steel were copperized in varying amounts from approximately 0.01 per cent up to 0.25 per cent. Sheets and test specimens from the various ingots were exposed to the weather for varying lengths of time and the following conclusions were drawn from the results:

1. Very low amounts of copper in steel materially lower the corrosion rate.
2. Steel with 0.03 per cent of copper corrodes only 60 to 70 per cent as fast as the same steel with 0.01 per cent of copper.
3. It has been customary to consider a copper content of any amount under 0.05 per cent as a trace, and it may be

desirable to reinterpret many corrosion data obtained in work in which the effect of these minute amounts of copper has not been taken into account.

4. In order to leave an ample factor of safety, steel to resist atmospheric corrosion should contain not less than 0.15 per cent of copper.

5. Copper in amount of 0.12 per cent is sufficient to neutralize the influence of sulphur as high as 0.055 per cent.

6. Copper in amount of 0.15 per cent is sufficient to protect steels even if the sulphur content is considerably higher than normal.

The sheets of the low-sulphur series were exposed in full size corrugated form on May 11, 1917, in the Connellsville coke regions in Pennsylvania, and those of the high sulphur series on March 11, 1918. The conclusions are drawn on an inspection 17 and 7½ months respectively after the tests were started.

Dr. Cushman held that the failures were due to the atmospheric conditions, that the tests were really acid atmosphere tests and in a class by themselves. Tests elsewhere did not check up, notably some of eight years' duration at Middletown, Ohio, with the testing racks located between the open-hearth plant and a canal. In the acid atmosphere he had noted on the under side of the sheets an incrustation of a salt, a ferrous sulphate, but no salt collects at Middletown, and the results do not tally with the two-year experiments near Pittsburgh. For one thing he emphasized that the slope of the sheets is important; that the steeper the longer the sheets last, other things being equal. In the acid atmosphere fogs favor the salt deposits and it is the drip off of the sheets that is most attacked. He intimated the possibility of a fresh discovery in respect to sheets, from the study of the microstructure, and regarded it as a dangerous practice to depend "on a modicum of copper" to offset a high sulphur content in the steel.

Mr. Buck claimed that the resistance to corrosion in terms of the copper content was shown to be of the same order, whether the sheets were coated or not, though coated sheets were not the subject of discussion and no specific evidence of the kind was offered. Indeed, one written discussion, contributed by A. F. Robinson, which indicated that sheet tests at Gary pointed to a copper content of 0.015 to 0.025 as a retardant—this discussion urged that it was academic to choose between chemically pure iron or copper bearing material when one had to depend on painting for genuine protection; that there is no such thing as rustless iron or steel. E. L. Lasier, assistant material engineer, bureau of construction and repair, Navy Department, noted Mr. Buck's preference for an increase of the copper to 0.15 per cent, but maintained it was still necessary to consider the combination of elements. He agreed that copper tended to offset sulphur, a corrosive element, and that small amounts of copper seemed beneficial. Mr. Buck in conclusion claimed that more than 1,000,000 tons of low-copper steel sheets had been sold to the trade and the copper factor had not affected weldability.

Malleable Castings

Malleable iron castings came in for special attention at the Thursday evening session. Coming closely after the recent meeting of the American Society of Mechanical Engineers at Detroit, where a notable monograph was submitted by Enrique Touceda covering research work on malleable iron, the new position of malleable iron as an engineering material was further stabilized by the contributions at Atlantic City. It was only a year ago that the society's sub-committee on malleable castings was organized and specifications have been drawn up and standardization of malleable foundry practice has proceeded far enough, as brought out, for instance, at the mechanical engineers' meeting, to warrant a high degree of dependence on malleable castings not merely for uniformity in performance but for measurably better physical characteristics. Besides the committee report, H. A. Schwartz, National Malleable Castings Co., Indianapolis, presented a paper covering a wide range of data under the title of "Some Physical Constants of Malleable Cast Iron," and Mr. Touceda and W. R. Bean, Eastern Malleable Iron Co.,

Naugatuck, Conn., entered into the discussion, Mr. Bean giving details of an investigation which was also reported on by Mr. Touceda at the Detroit mechanical engineering meeting. Meanwhile the American Malleable Castings Association held a meeting on Thursday at Atlantic City.

The definite action of the meeting was a unanimous vote to refer to a letter ballot for adoption as a standard the present "tentative specifications for malleable castings." These specifications "cover malleable castings for railroad, motor vehicle, agricultural implement and general machinery purposes."

In the year two criticisms were made of the specifications. One was that castings do not show as high tensile strength and elongation as the test bars. The other was that iron made to these specifications was difficult to machine, and the proposal was made that another specification be gotten out to cover castings

where machining qualities are a prime requisite. At a meeting of the committee, of which H. E. Diller is chairman and Mr. Touceda secretary, a sub-committee was appointed to obtain data on the relation of tests from bars and from castings. In answer to the other criticism it was pointed out that a number of foundries making castings to the present tentative specifications are having no difficulty in regard to the machining quality. However, the sub-committee appointed to get information on the relation of tests of castings to tests of bars was asked to look into the necessity of separate specifications for malleable iron where good



J. A. CAPP
President A. S. T. M.

machining qualities are required.

The Schwartz paper and, for that matter, the Touceda contribution to the American Society of Mechanical Engineers, are both available in pamphlet form. In a subsequent issue, however, an analysis will be made of these several studies. So noteworthy has been the progress made in quality that Dr. G. B. Waterhouse, Lackawanna Steel Co., felt called on to urge that in listing tables of constants the word "American" should be employed. The figures given by Mr. Schwartz were regarded as conservative, he himself emphasizing that they could be exceeded. In the matter of tensile strength, for example, he named as the average 48,000 to 50,000 lb. per sq. in. with an elongation in 2 in. of 10 to 15 per cent. Mr. Bean proved the fact of uniformity by pulling tests and taking photomicrographs of nine samples cut from a piece about 6 in. square. On the matter of machining qualities, he said one cannot demand great strength and at the same time expect to secure the machinability of gray iron castings.

Heat Treating Aluminum Alloy Castings

The effect of heat treatment of aluminum alloy castings was discussed briefly by Dr. P. D. Merica and C. P. Karr, covering experiments made at the Bureau of Standards. Their contribution was one of the features of the progress in the studies of engineering materials made through the American Society for Testing Materials. Dr. Merica agreed that more studies are needed, but the subject was important in pointing out the way of getting greater ductility and at the same time higher tensile strength. He suggested that alloys of 20,000 to 25,000 lb. tensile strength could be obtained with an elongation of not less than 5 per cent in 2 in. and thus a material which would not fracture when slightly overloaded.

Brass Specifications

Two tentative specifications were submitted by Committee B-2, one on brass ingot metal for sand castings

and the other on bronze bearing metal in ingot form. The alloys for brass ingot metal are divided into seven classes with tables covering the chemical analysis of each alloy, and also as an appendix are given examples of the uses for each grade and the physical characteristics of each grade corresponding to the desired composition. Bronze metal is divided into six grades. A tentative specification was also submitted for solder metal.

New President and Secretary

J. A. Capp, the newly elected president of the American Society for Testing Materials, is the head of the testing laboratory of the General Electric Co. at Schenectady, N. Y., and for practically all of his professional career he has been identified with that company. His college work was taken at the University of Pennsylvania, Philadelphia, in the mechanical engineering course. He left the university in 1891 and in 1892 became a student in the materials laboratory of the General Electric Co. at Lynn, Mass. He went to Schenectady in 1894 and in 1897 was made chief of the extensive testing laboratories there. His activities in the American Society for Testing Materials have covered a wide range of important committees—among others, those dealing with iron and steel, non-ferrous metals, copper wire, magnetic testing and lubricants. Two years ago he was made chairman of Committee A-1 on Steel, which from the standpoint of the extent of the industries and the value and importance of the product involved is the leading committee of the society.



CHARLES L. WARWICK
Secretary A. S. T. M.

Charles L. Warwick, Secretary

Announcement was made following the memorial to Dr. Edgar Marburg, on Tuesday evening, June 24, that early in 1918 Dr. Marburg had communicated to a few friends his intention of withdrawing from the secretaryship in 1920. He had expressed the hope that his successor would be Charles L. Warwick, who had been for 10 years his assistant. A. A. Stevenson, who made the announcement, said that at the spring meeting of the executive committee Mr. Warwick had been elected secretary, with the understanding that his election would take effect just after the memorial meeting to Dr. Marburg. He thereupon introduced Mr. Warwick as the new secretary, and the society gave him a warm greeting. Mr. Warwick made fitting acknowledgment of his debt to Dr. Marburg, under whose guidance he had been inducted into the work of the society. Mr. Warwick graduated in civil engineering from the University of Pennsylvania in 1909 and from that year has been instructor of civil engineering in the university, specializing in subjects relating to structural engineering. Since Dr. Marburg's death he has been assistant professor of structural engineering. This connection with the university he now gives up to devote himself entirely to the work of the American Society for Testing Materials. It is practically settled that the society in the next two months will establish permanent headquarters at the Engineers' Club in Philadelphia, its offices having been maintained for a number of years at the University of Pennsylvania.

Three Honorary Members

The session of Tuesday evening, June 24, was given up to the annual address and to tributes in memory of the late secretary, Dr. Edgar Marburg, who died on June 27, 1918, while last year's meeting was in prog-

ress. President G. H. Clamer had for his subject "Standardization" and he considered the subject chiefly in relation to industrial progress. Further reference to this paper will appear in a later issue of THE IRON AGE.

President Clamer gave the first of the five addresses of Tuesday evening, referred to in THE IRON AGE of June 26, which were a memorial to the late Edgar Marburg, for 16 years the society's secretary. The memorial exercises were highly impressive and at their conclusion the members rose in silent tribute to the man who did more than any other to bring the society to the high place it holds today.

The announcement that three honorary member-

ships—the first in the society's history—had been voted by the executive committee was a feature of the meeting. Honorary membership is only bestowed by unanimous vote of the executive committee, on proposal by ten members of the society. The three persons now honored are all past presidents—Dr. Henry M. Howe, Robert W. Hunt and Mansfield Merriman. Captain Hunt and Doctor Merriman were present and were enthusiastically greeted as they rose to recognize the honor conferred.

Two of the leading papers of the meeting—that of F. M. Waring and K. E. Hofamann on "Deep Etching of Rails and Forgings" and that of Dr. J. A. Mathews on "Modern High Speed Steel"—together with the valuable contributions in discussion of them, appear on other pages.

AMERICAN USE OF SWEDISH IRON

Axel Wahlberg's Mission to This Country for Its Promotion

The future of the iron and steel industry of Sweden depends largely upon a reduction in the cost of coal, one warranting an adjustment in steel prices to enable the Swedish products to enter foreign markets on a more closely competitive basis than is possible under existing conditions, according to Axel Wahlberg, head of the technical branch of the Jernkontoret, the organization of Swedish iron masters and engineers at Stockholm. Mr. Wahlberg, who on several occasions since 1892 has visited this country in the interests of the Swedish iron and steel industry, will return home shortly after several months spent in the United States for the purpose of promoting purchase of Swedish products by American industries now selling their own manufactures in Sweden.

The needs of Sweden for iron and steel products of sizes within the limits of her own mill capacities, Mr. Wahlberg said to an IRON AGE representative, are easily taken care of for the entire year in an operating period of 25 days. The bulk of the year's production, therefore, must be disposed of abroad. Steel products of larger dimension or of types more economically purchased in other countries are imported by Sweden. Before the war the United States did not make any special effort to get its share of this trade, and England was not then in a position to compete with Germany. Today, on the other hand, conditions are such that the United States can sell steel products to Sweden in open competition with the world.

Mr. Wahlberg's sojourn in this country since early in April has been solely in the interest of a more equitable reciprocity in trade between the two countries. The reasons he has urged why the United States should purchase more freely from Sweden, which is now taking a greater tonnage of American products than it was ever anticipated would be possible, have everywhere, he states, in Governmental and financial circles and in the steel industry, been received with approval. The Swedish Government is taking no official steps to bring about such a development, however, and Mr. Wahlberg reports that the apparent willingness of manufacturers in the United States to assist in such a trade rapprochement coincides with the general opinion in Sweden that the matter is best left to be worked out by individual business interests.

The cost of fuel in the interior of Sweden with the higher wages paid British miners, various duties and ocean war freight rates, is estimated at about \$40 per metric ton. This has caused an increased use of wood and charcoal, with a consequent scarcity and a rise in the price of the latter in keeping with the advance in coal, so that all fuel in Sweden is greatly enhanced in value. Mr. Wahlberg estimates that the fuel necessary for the pre-war rate of operation in Sweden would cost \$200,000,000 more today than then.

The phenomenal growth in the electrical steel industry during the war, Mr. Wahlberg believes, will undoubtedly have the effect of cutting down the tonnage of Swedish iron and steel in some directions;

but the increased consumption of steel in the United States due to the natural increase in population and other causes will more than make up for any loss in that direction.

Swedish quotations are for the present nominal. Orders from the United States are slightly increasing. No prices are published for the present and the quarterly price lists which were abandoned when war began have not yet been restored, but doubtless will be in a short time.

Wire Industry of Australia

Australia uses more fencing wire than any other country in the world, according to the London *Ironmonger*. Statistics of the Commonwealth show that the imports of iron and steel wire and barbed wire since 1912 had a value of £3,238,000. In 1917-1918 barbed wire valued at £16,056 and iron and steel wire valued at £469,924 were imported. Now that Australia is importing her own iron and steel, the importation of fencing wires should rapidly decrease. Already the manufacture of black wire in Melbourne has lowered prices considerably. When the new wire-drawing plants at Newcastle are in operation, still lower levels are expected. The wire from which Lysaght Bros & Co., Ltd., are making wire netting is produced at their plant on the Parramatta River near Sydney, a departure forced on this company by the war.

German Steel Works Managers Imprisoned

An Associated Press cablegram from Coblenz, Germany, says:

"Sentences imposed upon Julius Mayer and Hugo Oehler, managers of a German steel works near Prum, within the occupied area, were approved by Lieut. Gen. Hunter Liggett, commander of the Army of Occupation. The men were convicted on charges of failing to deliver to the American forces 300,000 shells and shell forgings. They were sentenced to six months' imprisonment and fined 10,000 marks each by a military commission."

A proposed combination of the larger firms in the iron and steel trades in Japan who have stocks for disposal has apparently failed to realize, says the London *Ironmonger*. The Imperial Steel Works at Yawata has for disposal some 200,000 tons of steel made at high cost. Should the works wish to dispose of this steel at its cost price, buyers will be asked for an unreasonable figure; should, on the other hand, the works lower their selling price to that approximating to the current market price, the difference between manufacturing cost and selling price would have to be adjusted at the expense of the taxpayer. According to the British Commercial Secretary at Yokohama, English pig iron is stated to be being offered in Japan at a price considerably below Japanese costs of production.

Railroad building in Canada has again become active. The Canadian Government Railways has recently let the contract for the construction of 11 branch lines in the Canadian West during the summer. These are stated to aggregate about 400 miles of roadbed and involve an expenditure of about \$10,000,000.

ANATOMY OF DROP FORGINGS

Some Causes of Failures—Gear Blanks and Die Blocks—Twisting Crankshafts

At a recent meeting of the Association of Drop Forgers and Stampers (British) at Birmingham, England, a lecture was delivered by Dr. Leslie Aitchison on the "Anatomy of a Drop Forging." An abstract from the *London Iron and Coal Trades Review* follows:

"Dr. Aitchison said that, just as in the human body the definite and orderly arrangement of the constituent parts was necessary for the performance of the normal functions, so a drop forging should have its constituent parts properly arranged. The outer form was fixed, but the internal arrangement could be varied very much. The parent of a good steel drop forging must be a good steel ingot.

Ingot Structure of Pine Tree Crystals

"Having described the pine-tree structure produced by crystallization during the cooling of the ingot, Dr. Aitchison pointed out that one of the results of the more rapid cooling of the outer part and the fixing of this envelope preventing contraction, was that there existed, either in the middle of the ingot or as an annular ring lying about one-fifth of the diameter from the edge, a region which was the weakest part of the ingot, the crystals not being bound so closely together as were those in the part which froze earlier.

"The ingot structure of interlocking pine tree crystals was a very permanent one, and was barely affected by any operations of heat treatment apart from melting. If, however, work was done on the steel, then the whole structure might be altered. The effect of working was to distort, break up and rearrange the crystals. In general this took place in such a way as to draw out the pine tree crystals into long thin fibres, lying along the forged material with their lengths all more or less parallel to the direction in which the piece of cast steel was drawn out. The results obtained for impact, elongation, and reduction of area depended almost entirely upon the direction of the grain in the test piece.

Arrangement of the Fibres of the Steel

"Bearing these results in mind, it became apparent that the anatomy of the good drop forging should be so arranged that the fibres of the steel were placed perpendicular to the principal stresses, so that if there was a bending stress it would have to go through the fibres and not between them. In a crankshaft at least two anatomical arrangements were possible, one in which the grain was arranged to follow the contour of the shaft, and the other in which the grain was in the same direction throughout, always lying parallel to the axis of the shaft. The two arrangements differed principally in the webs and this was the part which probably had to bear the greatest stresses—particularly bending stresses. In the first arrangement, if a fracture by bending stress occurred it would have to go through the fibres. In the second, it would be able to go between the fibres, a very much easier process. In the first arrangement the forging was anatomically in a condition to resist fracture but in the second it anatomically asked for breaks.

Gear Blanks

"Gear blanks gave even more conspicuous evidence of the value of the correct anatomy of the forging. They might be made by at least two definite methods, one in which a piece of bar was up-ended and splayed out in a direction always perpendicular to the axis of the piece, and the second in which the bar was laid flat in the dies and squeezed out in one part perpendicular to the axis of the bar, and in the other parts was elongated parallel to it. The structure produced by the first method was uniform in all parts of the blank, there being no difference in the macro-structure of the teeth cut in one part from that of the teeth cut in any other part. With the second method the macro-structures of the teeth in the

different parts of the gear varied completely. In one part the fibres ran parallel to the radius of the gear and in another perpendicular to it, parallel to the circumference of the gear and parallel to the pitch line of the teeth. In the former case a fracture would have to break across all the fibres; in the latter it would proceed by going in between the fibres so that the resistance would be very much less. In actual practice this was what did happen.

Effect of Twisting Crankshafts

"With regard to holes produced in the forgings during the operation of twisting, Dr. Aitchison said that if a crankshaft was twisted in a proper manner it was doubtful whether any harm resulted in the operation. If, however, steel which was being twisted contained flaws, such as noticeable cracks or discontinuities between crystals which had not been properly closed, the operation of twisting might easily result in the growth or extension of these cracks, the effect of which upon the shaft might be imagined. The effect of twisting a journal was shown to be the obliteration of the casting structure and its replacement by the structure of a forged steel.

The Case of Die Blocks

"As a concluding instance of the importance of the anatomy of the steel to a drop forger, Dr. Aitchison adduced die blocks. These were generally made of forged steel, and consequently had a fibrous macro-structure, with the fibres running in the direction in which the steel had been drawn out during forging. The block might be imagined to be very similar to a cut length of cable, the end faces being comparable with the points at which the cable was cut. The considerable impact blows which the die block had to withstand when working tended to enlarge the sunk impression in its face. If the impression was cut upon one of the end faces then, whatever part of the periphery of the impression might be subject to the blow, the stresses would tend to pull the fibres apart. Either of the other pairs of faces would present a greater resistance to the cracking of the steel or to the splitting apart of the fibres, and it was possible on these faces to arrange the impression in such a way that the greatest stresses which occurred in the die should be impressed on the material across the fibres. In such a case there was very much less likelihood of a die block being burst."

The Frank B. Ward Co. has succeeded to the business of Frank B. Ward, 501 Park Building, Pittsburgh, Mr. Ward being head of the company, assisted by A. H. Krigger, late lieutenant of aviation corps. The company represents the Elwell-Parker Electric Co., Cleveland, electric storage battery trucks and tractors, the J. D. Fate Co., Plymouth, Ohio, and Vulcan Iron Works, Wilkes-Barre, Pa., builder of gasoline locomotives, and the Nazel Engineering & Machine Works, Philadelphia, builder of pneumatic power forging hammers. The company will handle other lines of labor saving machinery in the territory embraced in western Pennsylvania, West Virginia and Ohio.

In a decision handed down on June 13 the Minnesota Supreme Court ruled that the royalty of 25c. a ton to the State which is mentioned in leases of State-owned ore lands, applies to iron ore as removed from the natural bed and not upon the concentrated tonnage. State mineral experts have estimated that the decision means an increased revenue of between \$2,000,000 and \$3,000,000 annually. The holding constitutes a reversal of the decision of the St. Louis County District Court, which decided in favor of the Hobart Mining Co. in a suit against it by the State.

The Lukens Steel Co., Philadelphia, has issued a new card showing the products rolled at its new 204-in. mill. The mill makes rectangular plates 186 in. wide and upward and circles of 195 in. in diameter and upward.

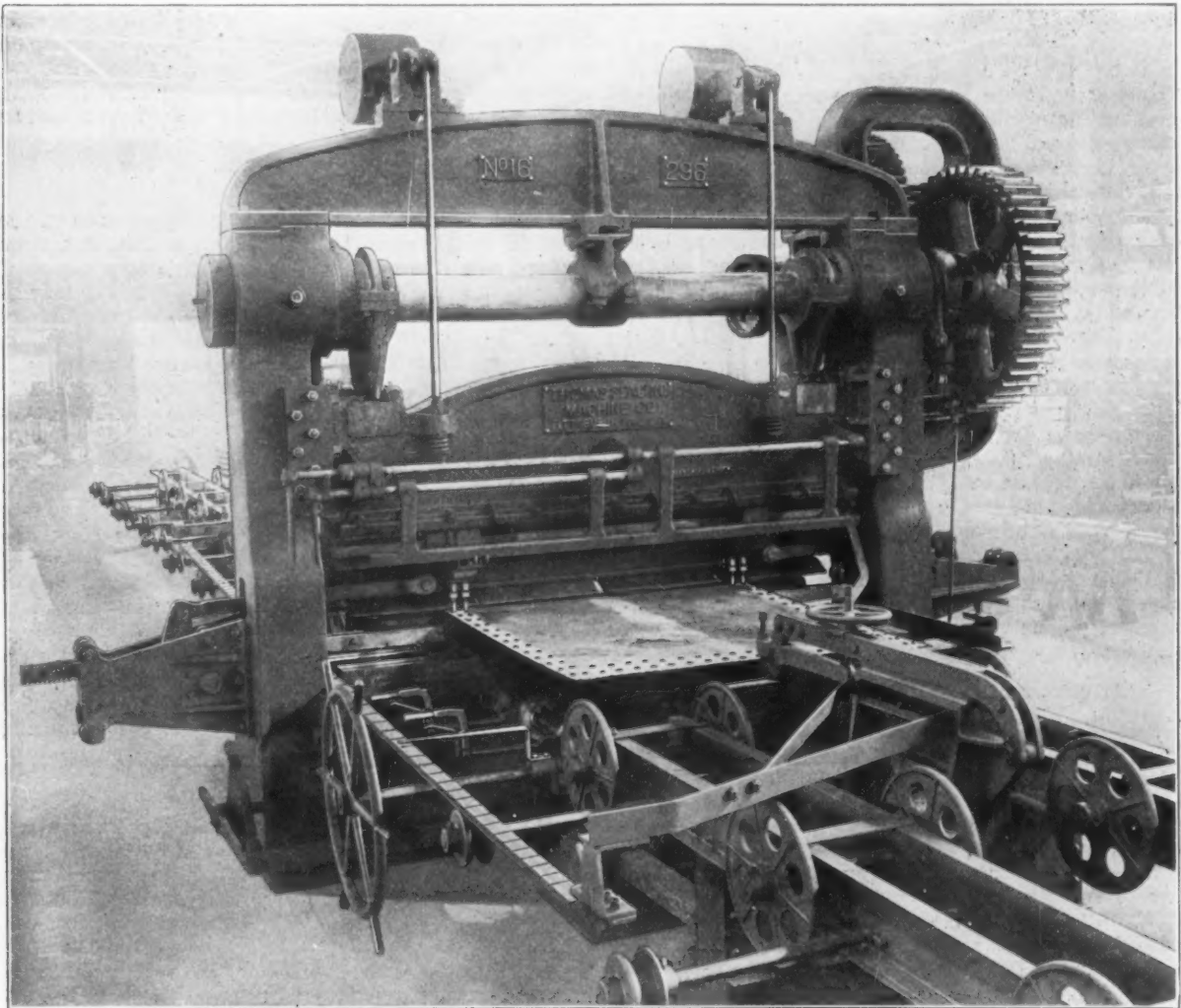
PUNCH OF WIDE ADAPTABILITY

Side Shift of Plates Unnecessary in Novel Machine with Sliding Punches

A machine primarily designed to punch ship plates which, because of the irregular spacing of holes, cannot be punched on a regular multiple punch, was recently built for the Great Lakes Engineering Works, Detroit, by the Thomas Spacing Machine Co., Fulton Building, Pittsburgh. The machine, having sliding punches, will punch one or more holes in any desired location without any sidewise shift of the plate. Aside from eliminating the disadvantage of working with a single punch, it retains some of the speed of the multiple punching machine, and will handle any kind of flat

punch. The sliding punches are shifted aside, and standard punching units, capable of being set down to 2-in. centers, are used, or else regular movable punches can be used for the crosswise punching and a steel templet for the lengthwise punching. The steel templet is made of $\frac{1}{4}$ to $\frac{3}{8}$ by 2-in. bar with notches for the desired spacing. The wood templet works in connection with an indicator. It is made of ordinary templet lumber, about $\frac{5}{8}$ or $\frac{3}{4}$ in. thick, and about $2\frac{1}{2}$ in. wide. The steel templet with the notches provides a fixed stop in connection with a pawl mounted near the punch. The pawl is stationary, and the templet travels with the carriage.

The sliding punches mounted on the ram of the machine are controlled by means of a ratchet lever. In the half-tone herewith is shown an arrangement of punches making four tools which move symmetrically in



Punching Machine Designed and Built by the Thomas Spacing Machine Co. It has sliding punches which can be made to move in and out from the center of the ram

plates. It can be controlled by one man in any one of three ways of operation, as follows:

First, by punching marked plates to centers, the movement being controlled with two hand levers, about the same as with the one-man table and a single punch, except that the plate moves only in one direction. The punches sliding across the face of the punch eliminate the necessity of the side shift.

Second, by punching to templet and indicator. In this case, the plate is not marked, and the spacing lengthwise is obtained from a wood templet traveling with the plate, and the crosswise spacing is also obtained from a templet moving with the punches. The movement of the plate is controlled by hand wheel, and the punches by ratchet lever.

Third, it can be used as a regular multiple punch with hand-operated spacing table, where the number of plates to be punched will warrant making a steel templet, and setting up punches across the face of the

and out from the center of the ram. More may be attached, or only one may be used, according to the nature of the work. If punching plates with but one single line of holes across the ends and sides, the single punch arrangement would suit best. Starting at the center, the end holes can be punched two holes at a time, one on each side of the center, by shifting the punches until the side rows are reached. The punches then remain stationary, and the lengthwise movement of the plate for punching the sides commences. Two holes, one on each side, are punched until the end of the plate is reached. When the plate again becomes stationary, the punches are again shifted, this time toward each other until the center is reached.

If the plate should have two rows of holes down the sides, four punches can be used. The center between the punches and dies can be altered to suit by inserting separators of the proper thickness between them. The punches are gagged and controlled by hand lever from

the side within reach of the operator of the machine.

For plates that are not symmetrical, and where the holes are not in straight lines, punching to centers must ordinarily be resorted to, and punching must usually proceed as with a single punch. In this case, however, the two single punches operating symmetrically about the center are used, but only one is operating at one time. By operating the gag lever, either one or the other may be used, each punch covering its half of the plate.

The punches are of the floating type, and the point of the punch rests on the plate until the proper register is made by manipulating the plates lengthwise and the punches crosswise. When the mark is reached, an electric contact controlled by foot pressure operates the clutch by means of a magnet. The operator is close to his work, and only half the floor space is required for punching a plate, inasmuch as a side shift is unnecessary.

Punching a single hole to centers at one time, however, is an exception even on the most irregular plates. Usually the two rows of holes down the sides, as on ship plates, can be punched together and on a very large percentage can be punched to templet without marking. The punches and dies are kept in alignment by levers, the length of which is such that the punches can meet together at the center, and still permit the widest plate to go through. The vertical movement of the levers is small, being equal to the stroke of the ram at one end; the other end remains stationary with the parts connected to the dies. Lost motion is guarded against by making the knuckle joints large to provide proper bearings. The sliding punches are operated by means of a cut rack and gears.

The strippers are arranged in the same manner as on the ordinary multiple punch, except that they do not extend between the punches, but are made just long enough to clear the punches at the rear. The tables are similar to an ordinary hand-operated spacing table, except that the operator remains stationary and is located close to the punch. The movement of the plate is controlled by travelling carriage, to which the plate is attached by means of a clamp. The carriage is a light steel frame, its length being a little in excess of the longest plate to be punched. It is controlled by the operator in two ways, for punching to centers by means of ratchet lever, and for spacing with steel templet or to indicator with wood templet by means of the hand wheel. Both hand wheel and the ratchet lever control the carriage through cut gears and cut steel racks. The carrying rolls are fitted with ball bearings, and are independently mounted on the shafts. The plates are carried through the punch in a straight line, by means of side and tail guides.

To avoid loss of time in setting the plate in the proper places on the tables, centering clamps are provided, which enable the operator to position the plate. They consist of two independent clamps operating symmetrically on each side of the center of the table by means of right and left hand screw and actuated by hand wheels.

The method of operation for punching either to centers or to templates is as follows: A plate is dropped on the trailer table, the centering clamps are opened out about 1 in. greater than the width of the plate in order to allow it to drop freely on the rollers. The centering clamps are then closed by turning the hand wheel which centers the plate on the table. The tail guide is then put on the rear end of the plate and thus secured, the rear centering clamp is released, and opened out for the next plate.

At the punch end of the plate, if the holes are too close together, and too close to the end to permit hitching the carriage clamp, the centering clamp is opened just enough to allow the plate to move freely over the dies, and still remain properly centered. The first row of holes is then located by distance piece, held in the clamp in the same manner as on an ordinary multiple punch and spacing table. After the first line of holes has been located under the punches, the centering clamp is closed tight to hold the plate in position, and the

holes are then punched by shifting the punches, usually commencing at the center of the plate.

If the holes are so located that the carriage clamp can be hitched to the plate for the first row, then, after connecting the tail guide, the plate is merely pushed into the clamp, and the centering clamp next to the punch is opened out to allow the plate to clear, and also preparatory for the next plate.

To keep the plate free of the dies, a roller mounted on springs, located as close as possible to the dies, keeps the plate about $\frac{1}{8}$ in. above them.

Western Efficiency Society Discusses Co-operation

"Very few employers have a definite idea of what constitutes fair wages," said William Pitt, of the Irving-Pitt Mfg. Co., Kansas City, Mo., in an address before the national conference of the Western Efficiency Society, held at Hotel Sherman, Chicago, on June 18, 19, and 20. Mr. Pitt was emphatic in his condemnation of substitutes for wages, whether in the form of welfare work, division of profits, or otherwise. He asserted that if the employer will voluntarily make it his business to ascertain the value of the wage he delivers and the value of the service rendered and pays his wages on that basis, he will eliminate a large part of his labor difficulties.

E. S. Cowdrick, assistant to the president of the Colorado Fuel & Iron Co., described his company's plan for representation on committees of coal mine and steel mill workers in conjunction with representatives of the management. Through the committee scheme any workman can bring to the attention of the corporation any subject which seems important to him, such as housing conditions, working conditions and wages. The committee system is so constituted that appeals can be taken from the first committee to higher committees and finally to the president of the company. Up to date, salaried men, office men, foremen and minor officials have not been included in the plan, but within a short time elections will be called for these classes of employees to elect representatives. Work on committees is done for the most part on company time. The steel works committee meetings generally take place once a month, while in the mining districts meetings are held four or five times a year, but when they take place often last from two or three days to a week. For instance, committees on sanitation, health and housing, and on safety and accidents, make exhaustive inspections which consume from two to seven days.

Meyer Bloomfield, of Bloomfield & Bloomfield, Boston, who recently investigated the labor situation in Great Britain, stated that conferences between employers and employees on matters of mutual interest were becoming the common thing in that country. In England, he said, there are something like 35 industries now operating under the so-called Whitley council plan.

A report was read before the convention, summarizing the returns received from questionnaires sent to member firms regarding co-operative management. It was disclosed that many firms are considering or trying some form or other of industrial democracy, ranging from shop committees, grievance committees to representative bodies patterned after the Federal Government, or to purely co-operative plans. The various plans differ so materially in detail and the results obtained depend so much upon individual circumstances that generalization would be unsound. The report made it thoroughly apparent, however, that the idea of the employees' representation is gaining headway and that the way in which it is applied is not so important as a spirit of fair-mindedness in carrying it out.

A strike of union molders is on in Indianapolis, affecting chiefly the smaller shops. The demand is for \$6 a day of eight hr. as against an offer of \$5.60 for 8½ hr. These differences have been in controversy since Nov. 1 last. For night work \$5.75 for 8½ hr. is offered by the employers.

BLAST FURNACES GAINING

June Production 2500 Tons a Day Greater

Output the Past Month 2,114,863 Gross Tons—
Ferroalloys Total 14,254 Tons—Two Hundred
Furnaces in Blast July 1

Blast furnace operations showed a slight improvement in June both in the daily rate of production, which averaged 70,495 gross tons as compared with 68,002 tons during May, and in the number of active stacks, which showed on July 1 a net gain of five, 17 having been blown in and 12 blown out. The output for June, a 30-day month, was 2,114,863 gross tons, as compared with 2,108,056 tons in May, a 31-day month. Ferroalloy production amounted to 14,254 gross tons, of which about 70 per cent was ferromanganese. The estimated capacity of the 200 furnaces active July 1 is 71,700 gross tons a day as compared with 195 furnaces rated at 68,600 tons active June 1.

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces for June and the three months preceding:

Pig Iron Production by Districts—Gross Tons

	June (30 days)	May (31 days)	April (30 days)	March (31 days)
New York	120,989	135,110	166,169	194,375
New Jersey	8,034	9,621	9,372	23,437
Lehigh Valley	67,706	72,660	72,155	90,086
Schuylkill Valley....	49,866	53,861	54,755	81,683
Lower Susquehanna and Lebanon Val- leys	36,255	43,797	39,334	49,743
Pittsburgh district..	461,268	446,998	531,517	661,307
Shenango Valley....	105,608	77,657	113,765	144,918
Western Pennsylv- ania	95,280	91,992	114,248	140,364
Maryland, Virginia and Kentucky....	31,694	34,012	55,957	78,748
Wheeling district....	53,002	46,799	82,641	115,104
Mahoning Valley ...	254,507	234,007	221,918	285,944
Central and North- ern Ohio	185,158	208,059	268,784	319,768
Southern Ohio	58,912	59,132	51,998	48,820
Chicago district....	358,119	344,390	416,009	532,511
Mich., Minn., Mo., Wis., Colo. and Wash.	81,729	100,108	112,811	117,682
Alabama	139,159	137,169	149,708	182,845
Tennessee	7,452	12,684	17,077	22,908
Total	2,114,738	2,108,056	2,478,218	3,090,243

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from June, 1918, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons

	Steel Works	Merchant	Total
June, 1918.....	81,734	29,059	110,793
July	79,248	31,106	110,354
August	80,947	28,394	109,341
September	83,579	30,363	113,942
October	83,686	28,796	112,482
November	83,395	28,407	111,802
December	81,445	29,317	110,762
January, 1919	78,388	28,137	106,525
February	78,910	26,096	105,006
March	73,468	26,217	99,685
April	61,289	21,318	82,607
May	51,187	16,815	68,002
June	51,865	18,630	70,495

The figures for daily average production, beginning with January, 1913, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1913—Gross Tons

	1913	1914	1915	1916	1917	1918	1919
Jan.	90,172	60,808	51,659	102,746	101,643	77,799	106,525
Feb.	92,369	67,453	59,813	106,456	94,473	82,835	105,006
Mar.	89,147	75,738	66,575	107,667	104,882	103,648	99,685
Apr.	91,759	75,665	70,550	107,592	111,165	109,607	82,607
May	91,039	67,506	73,015	108,422	110,238	111,175	68,002
June	87,619	63,916	79,361	107,053	109,002	110,793	70,495
July	82,601	63,150	82,691	104,017	107,820	110,354	.....
Aug.	82,057	64,363	89,666	103,346	104,772	109,341	.....
Sept.	83,531	62,753	95,085	106,745	104,465	113,942	.....
Oct.	82,133	57,361	100,822	113,189	106,550	112,482	.....
Nov.	74,453	50,611	101,244	110,394	106,859	111,802	.....
Dec.	63,987	48,896	103,333	102,537	92,997	110,762	.....

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel com-

panies show the following totals of steelmaking iron month by month, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Total production			Spiegeleisen and ferromanganese		
	1917	1918	1919	1917	1918	1919
Jan.	2,244,203	1,756,208	2,430,022	38,792	30,695	32,787
Feb.	1,829,846	1,620,254	2,209,470	32,137	26,114	28,105
Mar.	2,285,430	2,349,419	2,277,507	36,563	39,122	26,644
Apr.	2,370,937	2,411,488	1,838,677	39,595	35,511	17,308
May	2,404,380	2,513,577	1,586,805	37,701	54,633	14,604
June	2,304,155	2,407,166	1,655,944	30,829	44,844	14,254
July	2,369,630	2,456,693	.....	43,884	51,762	.....
Aug.	2,214,513	2,509,357	.....	39,492	54,009	.....
Sept.	2,198,705	2,507,381	.....	42,235	66,275	.....
Oct.	2,376,589	2,594,277	.....	48,691	70,379	.....
Nov.	2,349,545	2,501,867	.....	34,688	59,638	.....
Dec.	2,094,659	2,524,794	.....	29,902	49,435	.....

The furnaces blown in include Harriet X, two Lackawanna and No. 1 Donner in the Buffalo district; Leesport in the Schuylkill Valley; one Eliza in the Pittsburgh district; one Shenango in the Shenango Valley; No. 4 Mingo and Martin's Ferry in the Wheeling district; Tod, No. 5 Ohio, No. 2 Haselton and the two Hubbard stacks in the Mahoning Valley; Detroit "A" in Michigan, and one Woodward Iron Co. furnace in Alabama.

Among the furnaces blown out are Sheridan in the Lebanon Valley; No. 2 Lucy in the Pittsburgh district, Claire in the Shenango Valley; Adrian and Punxy in western Pennsylvania, Big Stone Gap in Virginia, Anna in the Mahoning Valley, Belfont in southern Ohio; Missouri at St. Louis; Woodstock in Alabama, and Johnson City in Tennessee.

Capacity in Blast July 1

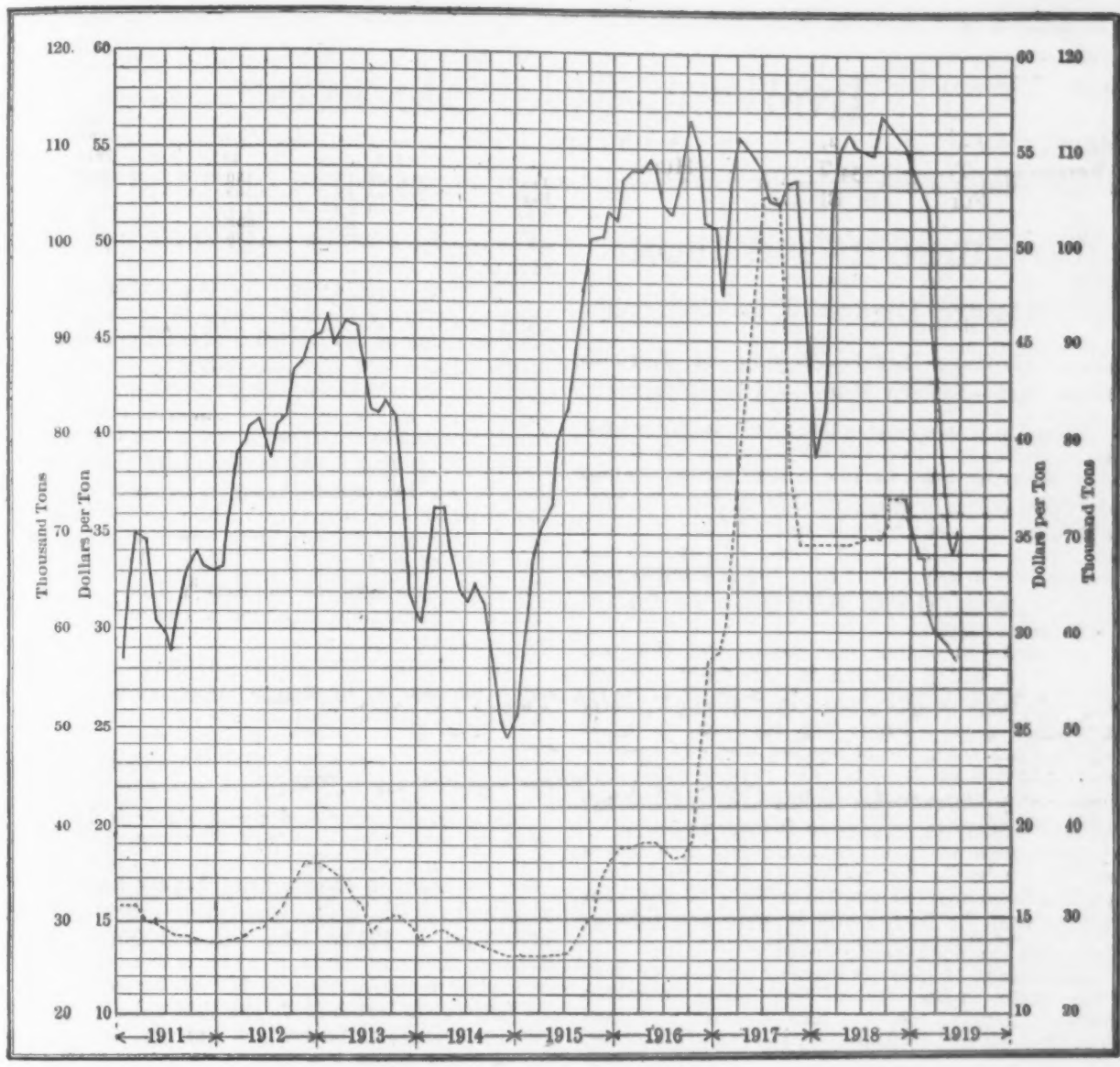
The following table shows the number of furnaces in blast July 1 in the different districts and their capacity, also the number and daily capacity in gross tons of furnaces in blast June 1:

Coke and Anthracite Furnaces in Blast

Location of furnaces	Total Number of stacks		July 1 Number in blast		June 1 Capacity per day		Number Capacity in blast per day	
	Number		Capacity		Number		Capacity	
New York:								
Buffalo	22	14	4,390	10	3,500			
Other N. Y.	4	1	195	1	195			
New Jersey.....	5	2	310	2	310			
Pennsylvania:								
Lehigh Valley..	18	10	2,170	10	2,015			
Spiegel	2	1	95	1	95			
Schuylkill Val- ley	16	6	1,885	5	1,810			
Lower Susque- hanna	11	2	875	2	875			
Lebanon Val- ley	6	1	200	2	365			
Ferro and Spiegel	4	0	6	1	65			
Pittsb'gh Dist.	52	33	15,500	33	15,500			
Ferro and Spiegel	5	2	270	2	270			
Shenango Val- ley	19	10	3,170	10	3,070			
Western Penn- sylvania	28	10	3,050	11	3,100			
Maryland	4	1	360	1	360			
Wheeling Dist..	14	6	1,955	4	1,545			
Ohio:								
Mahoning Val- ley	27	20	8,550	16	7,250			
Central and Northern	26	14	6,100	14	5,955			
Southern	17	9	1,900	10	1,810			
Ill. and Ind.	40	25	12,400	25	12,400			
Mich., Wis. and Colo.	13	7	1,650	6	1,310			
Mo. and Wash.	8	3	1,050	4	1,200			
The South:								
Virginia	17	4	580	5	500			
Kentucky	7	1	100	1	100			
Alabama	44	15	4,650	15	4,650			
Ferro	1	1	50	1	50			
Tennessee	17	2	225	3	300			
Total	427	200	71,700	195	68,600			

Diagram of Pig-Iron Production and Prices

The fluctuations in pig-iron production from 1910 to the present time are shown in the accompanying chart. The figures represented by the heavy line are those of daily average production by months of coke and anthracite iron. The dotted curve on the chart represents monthly average prices of Southern No. 2 foundry pig iron at Cincinnati, local No. 2 foundry iron at furnace at Chicago, and No. 2 X at Philadelphia. They are



The Full Line Represents the Daily Production of Pig Iron and the Dotted Line Is the Average of the Price Per Ton of No. 2 Southern Pig Iron at Cincinnati, Local No. 2 Iron at Chicago and No. 2X Iron at Philadelphia

based on the weekly market quotation of THE IRON AGE.

Production of Coke and Anthracite Pig Iron in the United States by Months, Beginning Jan. 1, 1915—Gross Tons

	1915	1916	1917	1918	1919
Jan. ...	1,601,421	3,185,121	3,150,938	2,411,768	3,302,260
Feb. ...	1,674,771	3,087,212	2,645,247	2,319,299	2,940,168
Mar. ...	2,063,834	3,337,691	3,251,352	3,213,091	3,090,283
Apr. ...	2,116,494	3,227,768	3,334,960	3,288,211	2,478,218
May ...	2,263,470	3,361,073	3,417,340	3,446,412	2,108,056
June ...	2,380,827	3,211,588	3,270,055	2,323,791	2,114,863
6 mos.	12,100,817	19,410,453	19,069,892	18,002,572	16,033,808
July ...	2,563,420	3,224,513	3,342,438	3,420,988	.....
Aug. ...	2,779,647	3,203,713	3,247,947	3,389,585	.....
Sept. ...	2,852,561	3,202,366	3,133,954	3,418,270	.....
Oct. ...	3,125,491	3,508,849	3,303,038	3,486,941	.....
Nov. ...	3,037,308	3,311,811	3,205,794	3,354,074	.....
Dec. ...	3,203,322	3,178,651	2,882,918	3,433,617	.....
Total, yr.*	29,662,566	39,039,356	38,185,981	38,506,249	.....

*These totals do not include charcoal pig iron. The 1918 production of this iron was 347,224 tons.

YOUNGSTOWN, OHIO, July 1.—Blast furnace operations here will improve with resumption of the stack of the A. M. Byers Co. at its Girard, Ohio, works, about July 15. It has been idle for over a month for repairs. Eighteen of 25 furnaces in the Mahoning Valley are producing metal. The Youngstown Sheet & Tube Co. has all of its six stacks active, averaging 3000 tons daily. The Republic Iron & Steel Co. blew in its Haselton No. 2 furnace on June 24 and now has in blast four out of the five furnaces in that group.

Sought Coal for Sweden

George K. Hamfeldt, now president of the Oxelosund Iron Works Co., Oxelosund, Sweden, was in Pittsburgh recently to investigate the matter of buying coal for coking purposes for a plant of 60 Koppers by-product coke ovens which his company operates in Sweden. However, Mr. Hamfeldt found that prices of coal in Pittsburgh were so high and freights to Sweden were so excessive that it was not feasible to buy coal in the Pittsburgh district and it is understood he did not make any purchases. Mr. Hamfeldt for some years was superintendent of the Carrie blast furnaces of the Carnegie Steel Co. at Rankin, Pa.

To provide for the purchase of a large interest in the St. Louis Coke & Chemical Co., St. Louis, Mo., the National Enameling & Stamping Co., 411 Fifth Avenue, New York, has arranged for a stock issue of \$1,453,400. The company specializes in the production of enameled wares; galvanized products; stamped, tinned, japanned, nicked and sheet metal wares, as well as plates and ingots. The estimated production of plates and ingots for the open market for the coming year is 450,000 tons. The St. Louis Coke Co. will furnish hot metal and other products for the company's mills. George W. Niedringhaus is president.

On the plan of the Chicago Building Trades Employers Association of Chicago the Calumet district association has been organized at Hammond, Ind. Employers and employees will reach agreements through representative bodies to prevent strikes.

Iron and Steel Markets

UP-TURN IN PIG IRON

June Average Highest Since September

Labor Shortage Likely—Buying of Agricultural Bars—Eastern Foundry Iron Weakness

June pig iron output shows definitely the turn in the industry. For the 30 days the total was 2,114,863 gross tons, or 70,495 tons a day, against 2,108,056 tons in May, or 68,002 tons a day. Seventeen furnaces blew in and 12 blew out last month, a gain of five, and estimated capacity active on July 1 was 71,700 tons a day for 200 furnaces, as compared with 68,600 tons a day for 195 furnaces on June 1.

The gain in output last month was the first check to a steady decline in the daily average from the high point reached in September, 1918, at 113,942 tons. From 372 furnaces in blast Sept. 1, last year, the shrinkage was 177 in nine months to 195 on June 1. The gain of 2500 tons a day in production last month over the average in May is likely to be carried further in July.

Pittsburgh producers estimate that new orders sent to the mills for rolling in June and June specifications against contracts were 50 per cent heavier than in May, while in wire and tubular products they were nearly double.

A shortage of labor is looming up as more than a possibility in the Central West, some producers there questioning whether blast furnace and steel works forces will be adequate for the scale of operations they consider likely in the fall months. Many more workers are planning to return to Europe and at some blast furnaces a scarcity of common labor is noticed already. Idle men at the gates of steel mills are now scarcely a factor.

The demand for oil line pipe is particularly good. The Texas Co. has been a free buyer and drilling plans of other companies look a year ahead. The Sinclair project to parallel the present oil line from Oklahoma to Texas would mean 150 miles of 8-in. and over 300 miles of 6-in. pipe. One pipe mill sold up for three months had to refuse a 25,000-ton order.

June was the best month in the sheet trade since October. Two mills that have led in cutting prices now have a backlog of orders and something like an oldtime pressure for deliveries is coming from the automobile industry.

The agricultural implement makers have begun ordering for last half needs; one has bought 10,000 tons of bars. Orders for special bars have been exceptionally good.

Interest in railroad buying has been kindled through a few inquiries. Two roads want 25 locomotives each and one of them is in the market for 110 tank cars. Incidentally, the Railroad Administration opposes the uniform practice of quoting on a Pittsburgh basis, demanding mill quotations. A reinstatement with a Chicago builder has been made of 525 military cars for France.

Glasgow bought 5000 tons of street railroad rails from the United States Steel Products Co., at £17

9s as against a British tender of £19 1s 6d, \$7.45 higher.

Tin plate specifications for September and October shipments have now been sent to the mills.

The action of the United States Shipping Board in granting a low rate on railroad equipment to South Africa will, it is hoped, be followed by other concessions which will help American manufacturers to extend their foreign trade. In last week's shipments on recent orders placed by the Government of the Netherlands, Colonial Department, were 800 tons of steel forgings, while 23,000 tons of bars, plates, shapes and sheets are now going, and 8000 tons of rails will soon follow. An order for 800 steel mine cars for the Dutch East Indies, to be used in mining tin, has been placed with a Cleveland company.

The extreme demands as to wages and hours made by the Amalgamated Association of Iron, Steel and Tin Workers have been rejected, but the concessions made by sheet and tin plate mills will represent an advance in production cost of about 5 per cent.

Sales of foundry and malleable iron in June in the Central West exceeded the amount of business done in any month this year. In Philadelphia some weakness is shown, sales having been made at \$29.10 for No. 2 X. One furnace soon to blow in will sell at \$29 or less, delivered Philadelphia. Between 6000 and 7000 tons of basic were sold there to a plate manufacturer at \$26 at furnace.

Activity in last half of the year coke continues and the market is 25 cents a ton higher on both furnace and foundry grades.

In wire rods mills are well booked for the third quarter, and meanwhile export inquiries have been received from Canada, England, Japan and India.

Pittsburgh

PITTSBURGH, July 1.

Local steel mills report that orders received in June and sent to the mills for rolling, also specifications against contracts, were at least 50 per cent heavier than in May, while in wire products and tubular goods they were nearly double. One leading pipe interest reports that its orders and specifications in June were more than double its production, and its mills are running at close to 90 per cent of capacity. A large wire interest reports that its June business was nearly 100 per cent greater than in May, and this company is sold up for the third quarter. Sales managers of the large steel companies predict that by October steel operations will be on a 90 per cent basis or even better.

The one menace that is confronting the steel business now is the supply of labor. Two leading officials of a large steel interest predict that by fall there will be an acute shortage in labor. A recent investigation made among the employees of a Valley blast furnace showed that 30 per cent of the men are going back home as soon as they can get vessel accommodations. There is to-day a shortage of labor among blast furnaces and steel plants, and this promises to become much worse as time goes on. If the condition outlined above is realized, predictions are that there will be a great shortage in supply of pig iron and steel and higher prices in the latter part of this year or not later than the early part of next year. A leading pig

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	July 1, 1919	June 24, 1919	June 3, 1919	July 2, 1918
No. 2 X, Philadelphia...	\$29.00	\$29.50	\$29.50	\$34.40
No. 2, Valley furnace...	26.75	26.75	26.75	33.00
No. 2 Southern, Cincinnati...	28.35	28.35	28.50	36.60
No. 2, Birmingham, Ala...	24.75	24.75	25.75	33.00
No. 2, furnace, Chicago...	26.75	26.75	26.75	33.00
Basic, deliv., eastern Pa...	26.00	25.50	29.65	32.90
Basic, Valley furnace...	25.75	25.75	25.75	32.00
Bessemer, Pittsburgh...	29.35	29.35	29.35	36.60
Malleable, Ch'go...	27.25	27.25	27.25	33.50
Malleable, Valley...	27.25	27.25	27.25	33.50
Gray forge, Pittsburgh...	27.15	27.15	27.15	33.40
L. S. charcoal, Chicago...	38.85	38.85	38.85	37.85

Rails, Billets, Etc.,

Per Gross Ton:

Bess. rails, heavy, at mill...	45.00	45.00	45.00	55.00
O.-h. rails, heavy, at mill...	47.00	47.00	47.00	57.00
Bess. billets, Pittsburgh...	38.50	38.50	38.50	47.50
O.-h. billets, Pittsburgh...	38.50	38.50	38.50	47.50
O.-h. sheet bars, P'gh...	42.00	42.00	42.00	51.00
Forging billets, base, P'gh...	51.00	51.00	51.00	60.00
O.-h. billets, Philadelphia...	42.50	42.50	42.50	51.30
Wire rods, Pittsburgh...	52.00	52.00	52.00	57.00

Finished Iron and Steel,

Per Lb. to Large Buyers:

	Cents	Cents	Cents	Cents
Iron bars, Philadelphia...	2.595	2.595	2.595	3.73
Iron bars, Pittsburgh...	2.75	2.35	2.35	3.50
Iron bars, Chicago...	2.50	2.50	2.50	3.50
Steel bars, Pittsburgh...	2.35	2.35	2.35	2.90
Steel bars, New York...	2.62	2.62	2.62	3.145
Tank plates, Pittsburgh...	2.65	2.65	2.65	3.25
Tank plates, New York...	2.92	2.92	2.92	3.495
Beams, etc., Pittsburgh...	2.45	2.45	2.45	3.00
Beams, etc., New York...	2.72	2.72	2.72	3.45
Skelp, grooved steel, P'gh...	2.45	2.45	2.45	2.90
Skelp, sheared steel, P'gh...	2.65	2.65	2.65	3.25
Steel hoops, Pittsburgh...	3.05	3.05	3.05	3.50

*The average switching charge for delivery to foundries in the Chicago district is 50c per ton.

†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

Sheets, Nails and Wire,	July 1, 1919	June 24, 1919	June 3, 1919	July 2, 1918
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 28, P'gh...	4.35	4.35	4.35	5.00
Sheets, galv., No. 28, P'gh...	5.70	5.70	5.70	6.25
Wire nails, Pittsburgh...	3.25	3.25	3.25	3.50
Cut nails, Pittsburgh...	4.25	4.25	4.25	4.00
Fence wire, base, P'gh...	3.00	3.00	3.00	3.25
Barb wire, galv., P'gh...	4.10	4.10	4.10	4.35

Old Material, Per Gross Ton:

Carwheels, Chicago...	\$22.50	\$22.50	\$20.50	\$29.00
Carwheels, Philadelphia...	23.00	23.00	20.00	29.00
Heavy steel scrap, P'gh...	18.50	17.50	16.00	29.00
Heavy steel scrap, Phila...	18.50	17.00	15.50	29.00
Heavy steel scrap, Ch'go...	17.50	17.00	15.50	29.00
No. 1 cast, Pittsburgh...	19.00	19.00	17.00	29.00
No. 1 cast, Philadelphia...	22.00	22.00	22.00	29.00
No. 1 cast, Ch'go, net ton...	22.00	21.00	19.50	28.00
No. 1 RR. wrot., Phila...	23.00	22.00	21.00	34.00
No. 1 RR. wrot., Ch'go, net...	17.00	17.00	15.75	29.75

Coke, Connellsville,

Per Net Ton at Oven:

Furnace coke, prompt...	\$4.25	\$4.00	\$4.00	\$6.00
Furnace coke, future...	4.12	4.00	4.00	6.00
Foundry coke, prompt...	5.00	4.75	4.50	7.00
Foundry coke, future...	5.00	5.00	5.00	7.00

Metals,

Per Lb. to Large Buyers:

	Cents	Cents	Cents	Cents
Lake copper, New York...	19.25	18.50	16.75	23.50
Electrolytic copper, N. Y...	19.00	18.25	16.50	23.50
Spelter, St. Louis...	7.10	7.00	6.15	8.62 1/2
Spelter, New York...	7.45	7.35	6.50	8.87 1/2
Lead, St. Louis...	5.15	5.15	4.95	7.75
Lead, New York...	5.40	5.40	5.20	7.90
Tin, New York...	70.50	70.00	72.50	92.00
Antimony, Asiatic, N. Y...	8.37 1/2	8.37 1/2	8.37 1/2	13.00
Tin plate, 100-lb. box, P'gh...	\$7.00	\$7.00	\$7.00	\$7.75

iron producer looks for \$40 basic iron by the first of the year.

There will be no suspension of work among the sheet and tin plate mills, as the scales have been fixed; beyond a brief shutdown on July 4 and 5, the sheet and tin plate mills will continue in operation. As yet no settlement of the bar iron scale has been reached, but it is expected to be fixed by the latter part of this week.

Pig Iron.—As yet there is no active demand for Bessemer and basic iron, but foundry and malleable are being sold freely. It is understood most consumers of foundry iron have pretty well covered their needs over the remainder of the year, and as a result the foundry iron market has quieted down somewhat. The Standard Sanitary Mfg. Co. has been the largest buyer of foundry iron in the week, having bought 4000 tons of Southern No. 2 for its Louisville, Ky., plant, and 6000 tons for its Pittsburgh and New Brighton, Pa., plants. It is said the latter iron brought the full price of \$26.75 at Valley furnace. We also note a sale of 500 to 600 tons of basic for July and August at \$25.75, Valley furnace. Stocks of Bessemer and basic held by the merchant furnaces have been pretty well cleaned up, and there is very little resale iron on the market. Prices are reported firm, and we quote:

Basic pig iron, \$25.75; Bessemer, \$27.95; gray forge, \$25.75; No. 2 foundry, \$26.75; No. 3 foundry, \$26.25, and malleable, \$27.25; all per gross ton at Valley furnaces, the freight rate for delivery in the Cleveland and Pittsburgh districts being \$1.40 per ton.

Billets and Sheet Bars.—The greater activity in sheets and tin plate is causing a larger demand in the steel mills for sheet bars, shipments of which are now heavier than at any time for some months. There is very little open inquiry for billets or sheet bars, but steel mills in the Youngstown and Pittsburgh districts are now operating at 75 per cent of capacity. Prices are reported firm, and several sheet and tin plate mills that buy sheet bars in the open market are understood to be now trying to cover their needs for last quarter

of the year. There is an active demand for forging billets, and we note sales of 400 to 600 tons at the full price of \$51, makers' mill, Pittsburgh.

We quote 4 x 4 in. soft Bessemer and open-hearth billets at \$38.50, 2 x 2 in. billets at \$42; sheet bars, \$42; slabs, \$41, and forging billets, \$51 base, all f.o.b. at mill, Pittsburgh or Youngstown.

Ferroalloys.—Shortly after the \$110 price on 80 per cent ferromanganese for delivery over last half of the year was established by a leading New York house, its sales were reported to be so heavy that it withdrew this price in a few days, and again quoted \$125 delivered. However, English producers are now quoting 80 per cent at \$115, c.i.f. New York, freight added to point of delivery, and domestic makers are meeting this price. It seems, therefore, that the price to-day of English or domestic 80 per cent ferromanganese ranges from \$115 to \$120 per ton delivered. There is not much activity in ferrosilicon, as consumers seem well covered over the remainder of this year.

We quote 78 to 82 per cent resale ferromanganese at \$115 to \$120 delivered, with a reduction of about \$2 per unit for lower percentages. We quote domestic ferrosilicon at \$80 and 18 to 22 per cent spiegeleisen at \$33 to \$35, delivered. Prices on Bessemer ferrosilicon are: 9 per cent, \$47.75; 10 per cent, \$49.75; 11 per cent, \$53.05; 12 per cent, \$56.35. We quote 6 per cent silvery iron, \$36.75; 7 per cent, \$38.50; 8 per cent, \$40.25; 9 per cent, \$42.25, and 10 per cent, \$44.75. About \$3 per gross ton advance is charged for each 1 per cent silicon for 11 per cent and over. All the above prices are f.o.b. maker's furnace, Jackson or New Straitsville, Ohio, which have a uniform freight rate of \$2.90 per gross ton for delivery in the Pittsburgh district.

Plates.—Makers report there is very little, if any, improvement in the demand for plates. The Sun Shipbuilding Co. has received a contract for two coal vessels and the Jones & Laughlin Steel Co. has taken 4000 tons of plates and shapes, or about half the tonnage needed for the two boats. The steel car companies are doing very little and are taking only a very small part of their usual requirements in plates. Prices are fairly firm, but a few of the smaller plate mills are shading the market occasionally about \$2 per ton. The

price on $\frac{1}{4}$ -in. and heavier tank plates, effective from March 21, is 2.65c., Pittsburgh.

Structural Material.—Inquiry is active and a good deal of work is in sight. It develops that the report that the Jones & Laughlin Steel Co. has taken 500 tons for a new building for the Edison Electric Appliance Co. is incorrect, as up to Tuesday this work had not been placed. The McClintic-Marshall Co. has taken 4000 tons for steel buildings for the new plant of the Kelly-Springfield Tire Co., Cumberland, Md., and the quantity may be increased to 7500 tons later; also 325 tons for new buildings for Dilworth, Porter & Co., Pittsburgh; also 2200 tons for a new office building for the William Street Corporation, to be built at John and William streets, New York, and 625 tons for new buildings for the Monroe Binder Board Co., Monroe, Mich. The American Bridge Co. has taken 2920 tons for three viaducts at Buffalo. Unconfirmed reports are that the Baltimore & Ohio Railroad has placed orders for a new steel bridge in this city, cost \$1,000,000. Fabricators state they are figuring on a very large amount of new work with good prospects that most of it will be closed at an early date. Bids have gone in on 10,000 tons for the new Hanna office building in Cleveland, and tentative inquiries are out for a part of the 60,000 tons or more of steel for the new Union Station in Cleveland. It will likely be some months, however, before any of the latter work is actually placed. Structural steel mills are now better filled up than for some time, but are still able to make fairly prompt delivery. We quote beams and channels up to 15 in. at 2.45c., Pittsburgh.

Sheets.—A leading sheet mill reports that its specifications for sheets received in June were more than double its shipments in that month, and this concern is now back from six to eight weeks in delivery on automobile and other high grade sheets. June was the best month in the sheet trade since last year, orders and specifications showing an increase over May of anywhere from 50 to 100 per cent. The cutting in prices on black and galvanized sheets is disappearing, two leading mills that were cutting prices rather severely now being very well filled up, and quoting nearly entirely the prices adopted on March 21. This week the American Sheet & Tin Plate Co. is operating its sheet mills to 85 per cent of capacity, but its mills will be down the last two days of this week. The demand for automobile sheets is abnormally heavy, and three or four mills that cater to this trade especially are filled for third quarter and are not promising any delivery now before last quarter. Export inquiry is still active, and heavy shipments of sheets are going abroad. The export demand for corrugated sheets for siding and roofing is heavy, indicating that reconstruction work in countries devastated by the war has actually commenced. Sheet mills are now looking forward to a 90 per cent, or better, operation within a very short time. The market is now reported firm. Prices on sheets effective from March 21 are given on page 66.

Tin Plate.—In the last two weeks in June, more orders were entered and specifications received by the mills for tin plate than in any previous month for some time. Specifications are now being received for shipments for tin plate in September and October. The American Sheet & Tin Plate Co. is operating this week to about 85 per cent of hot tin mill capacity, but will be down the last two days of this week. One leading mill reports it is operating 100 per cent and expects to maintain that rate for some time, while another mill is operating 75 per cent, and expects to put on six or eight more mills next week. Export inquiries are numerous, these ranging usually from 3000 to 10,000 boxes. A feature of the tin plate situation is that almost invariably with specifications comes a request for prompt shipment, showing that stocks held by the consumers are low. The demand for terne plate is heavy, especially from the West, where building operations are reported active. We quote production tin plate at \$7 per base box f.o.b. Pittsburgh, but on shipments from stock \$6.25 to \$6.50, is said to

be quoted, with more sales at the higher figure than at the lower. Prices on terne plate, effective from March 21, which are reported firmer, are given on page 66.

Iron and Steel Bars.—Local mills report the demand for steel bars as very active and operations are now on a 60 per cent basis. Specifications against contracts for shipment over third quarter are coming in freely. Jobbers are placing more orders and implement makers are commencing to specify on their contracts. The demand for reinforcing steel bars, and also for common iron bars is more active. It is reported that prices on steel and iron bars are firm.

We quote steel bars, rolled from billets, at 2.35c., and from old steel rails 2.45c. Eastern mills are quoting iron bars for eastern shipment at 2.35c., while for western shipment 2.55c., Pittsburgh, is quoted. Pittsburgh mills rolling iron bars quote at 2.75c., Pittsburgh, plus full freight rate to point of delivery.

Wire Rods.—The demand is fairly active and two or three local makers that sell a part of their product of rods in the open market now say they have sold about all the rods for third quarter they care to sell, as their wire and wire nail business is so heavy they are needing more rods right along. Export inquiry from Canada, England, Japan and India is fairly active. We note a sale of 500 tons of soft rods at \$52 and 300 tons of soft rods at \$52 and 300 tons of high carbon rods at about \$70 at mill. Prices on rods adopted March 21 are given on page 66.

Wire Products.—One leading mill reports its orders entered and specifications received for wire products in June nearly double those in May and this interest is now practically sold up for third quarter, and is not entering any new business for delivery before last quarter. Another local maker is now operating its wire and wire nail departments to about 85 per cent of capacity. Jobbers are trying to cover as far ahead as possible and the demand for wire products is now beyond the ability of the mills to supply as promptly as wanted. There are signs that an advance in wire products may come before long, but it is said one leading interest is opposed to a higher market at this time. Prices on wire products, as adopted March 21, are very firm, and are given on page 66.

Cotton Ties.—Most large consumers are covered on their needs for cotton ties for this season and shipments by the mills in July promise to be heavy. We quote \$1.71½ per bundle of 45 lb. for July shipment, but most consumers are covered at the \$1.70 price fixed recently.

Hot-Rolled Strip Steel.—The demand is reported slightly better, but jobbers and consumers are still largely inclined to place orders only for current needs. Prices on hot-rolled strips range from 3.05c. to 3.30c. per lb., f.o.b. Pittsburgh, some consumers paying the higher price for steel strips for deep stamping and drawing purposes.

Cold-Rolled Strip Steel.—The demand is only fairly active, but jobbers and consumers are now more inclined to cover their needs for third quarter, and some have done so.

We quote cold-rolled strip steel at \$5.65 base per 100 lb., f.o.b. Pittsburgh, for 1½ in. and wider, 0.100 in. and thicker hard tempered in coils 0.20 carbon and under. Boxing charge 25c. per 100 lb.

Hoops and Bands.—The demand for both hoops and bands is quiet, and no doubt has been adversely affected by the prohibition laws, which went into effect July 1. We quote hoops and bands at 3.05c., Pittsburgh, plus usual extras, and mills report this price is being held.

Shafting and Screw Stock.—Two local makers report the demand for shafting as considerably better than in May. Jobbers are placing orders freely and are inclined to stock ahead for third quarter. We quote cold-rolled shafting at 28 per cent off for carloads and 23 per cent off in less than car lots, f.o.b., Pittsburgh. Some makers are still slightly shading these prices.

Nuts and Bolts.—Makers report a larger demand from the consumer, and jobbers are also buying more freely, desiring to stock up over third quarter as fully as they can. It is said cutting in prices has largely

disappeared and consumers of nuts and bolts insist the market should be higher in the near future, as prices are entirely out of line with the high cost of steel bars and labor. Discounts, as adopted March 28, which are now firm, are given on page 66.

Spikes.—The demand is a little better, coming largely from jobbers who are inclined to stock up over third quarter, but railroads are buying very little. Prices are reported as being held.

We quote standard spikes, 9/16 x 4 1/2 in., and also small spikes, \$3.35 base per 100 lb. in carload lots of 200 kegs or more, plus usual extras. Boat and barge spikes, \$3.85 per 100 lb. in carload lots of 200 kegs or more.

Boiler Tubes.—Several makers report the demand for boiler tubes as slightly better, but merchant tubes are very quiet. There has been some pretty severe cutting in prices of tubes for some time, owing to the small amount of business being placed, but it is now claimed the market is firm. Discounts on iron and steel tubes, adopted March 21, which still are considerably shaded, are given on page 66.

Iron and Steel Pipe.—Demand for lap-weld pipe and oil country goods is much beyond the ability of the mills to supply as fast as wanted. One mill recently has turned down over 25,000 tons of oil country goods, on which it did not care to quote, as it could not make the deliveries wanted, and this mill is sold up over the next three months, and does not care to sell farther ahead, as the company believes prices on tubular goods may be higher later in the year. Another large maker reports that its orders entered and specifications received in June were more than double its output, and this concern is also sold up for three to four months. In fact, all the mills are turning down business nearly every day in which they cannot make the delivery. Some heavy inquiries are in the market for line pipe, the largest being one from the Sinclair Oil & Refining Co., which proposes to parallel the present oil line from Oklahoma to Texas. It is said, if this line is laid, it will require about 150 miles of 8-in. and 300 or more miles of 6-in. The Texas Co. has been buying freely for some time of 6, 8, 10 and 12-in. line pipe. Drilling programs of the oil companies are being figured ahead for a year or more, and indicate very heavy requirements of oil country goods over the next 18 months. It seems likely the mills making tubular products have about all the work on their books and in sight that they can turn out over this year. Prices on line pipe, which recently were cut very severely, are now said to be holding firmly. Makers of wrought-iron pipe are having a good demand for their product, and orders are being placed more freely for butt-weld pipe, used entirely for building purposes. Discounts on iron and steel pipe, as effective from March 21, are given on page 66.

Coke.—There is still some activity in the placing of contracts for furnace coke for last half. A local producer closed a contract yesterday for 5000 tons of furnace coke per month over last half on the basis of 6 1/4 tons of coke to a ton of basic iron, the coke netting the maker \$4.12 at oven. The supply of prompt furnace coke is pretty well cleaned up, and prices are firm. Several sales of high-grade furnace coke for spot shipment have been made at \$4.25 per net ton at oven. Most furnace companies are now covered on their coke for third quarter and last half. We note sales of several good-sized lots of standard 72-hr. foundry coke at \$5 to \$5.25 at oven. We now quote standard grades of 48-hr. furnace coke for prompt shipment at \$4.25, while contracts based on the present price of basic iron, net \$4.12 at oven. We quote 72-hr. foundry coke for prompt shipment and on contracts for last half at \$5 to \$5.25 per net ton at oven. Output of coke in the Upper and Lower Connellsville regions last week was 131,200 tons, an increase over the previous week of slightly over 4000 tons. The output this week will probably fall off, owing to the holidays, Friday and Saturday.

Old Material.—The present demand for steel-making scrap is very active, and is heavier than the supply. Two or three leading consumers in this district are said

to be sounding the market for heavy purchases of scrap, but the quantity available is very small, and prices are firm and higher. About the only activity in the local scrap market is in heavy steel scrap, borings and turnings. Bids have gone in on the Pennsylvania Railroad scrap, which is to be awarded on Thursday, July 3, and it is said several local dealers have bid \$19 or higher for the steel scrap. A local dealer reports a sale of 1000 tons of select heavy steel melting scrap at \$19 per gross ton delivered. We quote for delivery to Pittsburgh consuming points, and other points that take Pittsburgh freights, in gross tons as follows:

Heavy steel, melting, Steubenville, Follansbee, Brackenridge, Monessen, Midland and Pittsburgh, delivered	\$18.50 to \$19.00
No. 1 cast, for steel plants	19.00 to 19.50
Re-rolling rails, Newark and Cambridge, Ohio; Cumberland, Md.; Franklin, Pa., and Pittsburgh	19.00 to 20.00
Compressed steel	14.50 to 15.00
Bundled sheet, sides and ends, f.o.b. consumers' mills, Pittsburgh district	13.50 to 14.00
Bundled sheet stamping	12.00 to 12.50
No. 1 busheling	14.50 to 15.00
Railroad grate bars	15.00 to 16.00
Low phosphorus melting stock (bloom and billet ends, heavy plates) 3/4 in. and heavier	23.00 to 24.00
Iron car axles	29.00 to 30.00
Locomotive axles, steel	29.00 to 30.00
Steel car axles	26.00 to 27.00
Railroad malleable	16.00 to 16.50
Machine shop turnings	9.50 to 10.00
Cast iron wheels	22.00 to 23.00
Roller steel wheels	19.00 to 20.00
Sheet bar crop ends (at origin)	19.00 to 19.50
Heavy steel axle turnings	13.50 to 14.00
Heavy breakable casts	19.50 to 20.00
Cast iron borings	12.50 to 13.50
No. 1 railroad wrought	19.50 to 20.00

The Pittsburgh District

Dilworth Porter & Co., Ltd., S. S. Pittsburgh, maker of railroad and boat spikes, tie plates, floor plates, chill and mill castings, has decided to entirely renew its repair department. The company is now building a new machine shop, blacksmith shop, iron foundry and store house. In the iron foundry will be two cupolas, one 30 in. and one 42 in., while in the machine shop part of the equipment has been bought, including a large Cleveland open side planer, but lathes and other equipment are yet to be purchased. About 325 tons of steel will be used in the new buildings, contract for which has been placed with the McClintic-Marshall Co., Pittsburgh.

Before adjournment of the annual convention of the National Retail Hardware Association, held in Pittsburgh last week, officers were elected as follows: J. M. Campbell of Bowling Green, Mo., president, succeeding M. D. Hussie of Omaha, Neb. Matthias Ludlow of Newark, N. J., was elected vice-president. Charles E. Halls of Indianapolis and R. W. Hatcher of Millidgeville, Ga., were elected new members of the executive committee. F. B. Boyce, Wellsville, N. Y.; E. M. Haley, Dubuque, Iowa; C. H. Casey, Jordan, Minn.; Hamp Williams, Hot Springs, Ark.; F. E. Strong, Battle Creek, Mich., and George M. Gray of Coshocton, Ohio, were elected to the committee. On Friday, June 27, the delegates to the number of nearly 300 made a visit of inspection to the blast furnaces, open-hearth steel plant, rod and wire mills of the American Steel & Wire Co. at Donora, Pa.

The office of L. A. Green, dealer in rails, machinery and general equipment, is now located in larger quarters on the 11th floor of the First National Bank Building, Pittsburgh.

The University of Pittsburgh has greatly enlarged its laboratory space for mechanical and electrical engineering with an addition of about 1800 sq. ft. of floor space. The new electrical laboratory, containing about 600 sq. ft., will be equipped with modern appliances, elevators and delicate precision instruments for the instruction of electrical engineering students. Together with the other laboratories, this new addition will give the university one of the most complete electrical layouts in any school in the country.

Chicago

CHICAGO, July 1.

One of the most encouraging features of the market is the rapidity with which inquiries are followed by purchases. Buyers no longer hope for lower prices, and, in fact, are considering the possibility of advances in some products.

The agricultural implement manufacturers have commenced to cover their last half requirements of mild steel and rail carbon bars. One order for 10,000 tons of mild steel bars has been booked. Among other purchases by farm implement makers was one for 6000 axle billets to be used on an export order and another for 600 short billets. Plates, which have been dull for some time, are showing signs of life. A local carbuilder has received authority to construct 575 military cars for France which had been suspended.

The demand for sheets is expanding. The leading interest has booked 1800 tons of rails from two independent railroads. Shapes, wire products and bolts and nuts continue active.

Pig iron is suffering a lull, while scrap continues to rise as the result of speculation on the part of dealers.

Pig Iron.—Sales of foundry and malleable in June greatly exceeded the amount of business done in any other month this year. Many individual purchases were for round tonnages, in some cases as large as 10,000 tons, but in general consumers have been rather conservative in buying for their last half requirements, and are expected to enter the market again later. At present sales and inquiries are less numerous than at any time since the recent buying movement started. This lull in the market is attributed to the holidays coming at the close of the week and to the fact that the vacation season is now under way. Several inquiries for from 500 to 600 tons of foundry have been received from agricultural implement manufacturers. A Michigan melter is in the market for 1200 tons of foundry. Most inquiries for both foundry and malleable at present are for amounts ranging from 1000 tons down. Prices are firmer than they were some weeks ago, when some sellers endeavored to encourage buying by offering concessions in silicon. Silveries are fairly active. One lot of 1800 tons was placed recently and an inquiry for 500 tons is before the trade. An inquiry for 500 tons of low phosphorus is also reported. There is no activity in basic in this market, but some sales are said to have taken place in St. Louis. Southern furnaces which recently sold considerable foundry on a Chicago and allied interests are contemplating the erection of a new blast furnace. The Woodward Iron Co. expects to blow in a fourth stack soon. Several hundred tons of spot coke from the Connellsville region have been placed with foundries in this district.

The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable and steel-making irons, including low phosphorus, which are f.o.b. furnace and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, average silicon, 1.50 second half delivery, f.o.b. furnace, average freight to Chicago \$2.50 (other grades subject to usual differentials).....	\$29.25
Northern coke foundry, No. 1 silicon, 2.25 to 2.75	28.00
Northern coke foundry, No. 2 silicon, 1.75 to 2.25	26.75
Northern high-phosphorus foundry.....	26.75
Southern coke, No. 1 foundry and No. 1 soft silicon, 2.75 to 3.25.....	29.75
Southern coke, No. 2 foundry, silicon, 2.25 to 2.75 (nominal)	33.00
Southern foundry silicon, 1.75 to 2.25 (nominal)	31.75
Malleable, not over 2.25 silicon.....	27.25
Standard Bessemer	27.95
Basic	25.75
Low phosphorus (copper free)	40.00
Silvery, 7 per cent.....	42.05

Ferroalloys.—During the recent temporary decline of ferromanganese to \$110 delivered, one seller sold from 1000 to 1500 tons. With the exception of this business there has been little activity in any of the ferroalloys. The Government is expected to ask for

bids soon on about 600 tons of spiegeleisen located at St. Louis. Resale ferrosilicon is about exhausted.

We quote 80 per cent ferromanganese at \$125, delivered; 50 per cent ferrosilicon, resale, at \$110, delivered; spiegeleisen, 18 to 22 per cent, \$35, furnace.

Structural Material.—The structural situation continues to improve. Warehouses and fabricators are buying generously to replenish their stocks, while the amount of building activity in this district promises to exceed the record of any previous year. Although there was a decline in fabricating inquiries and awards during the past week, there is a considerable amount of work in contemplation, the plans for which have not yet been completed. The prospects of export business in shapes are good. Orders for both shapes and sheets were recently received from Cuba. Recent awards to fabricators include:

Scullin Steel Co. for buildings for rolling mill, St. Louis, 1314 tons, divided between Christopher & Simpson Iron Works, Stupp Brothers Bridge & Iron Co., and Banner Iron Works.

Staley Mfg. Co. plant, Decatur, Ill., 1200 tons to Decatur Bridge Co.

Livingston Department Store, Bloomington, Ill., 300 tons, to Decatur Bridge Co.

Minneapolis Bridge Co., beam spans for Norman and Clay counties, Minn., 138 tons, to American Bridge Co.

The Mosher Mfg. Co., Dallas, Tex., will fabricate 1300 tons for the Dallas Federal Reserve Bank. Bethlehem shapes will be used. The Minneapolis Steel and Machinery Co. will fabricate 2500 tons for the Northwestern Telephone Co. Building, Minneapolis.

Recent inquiries include 350 tons for plant additions being erected by the Studebaker corporation, South Bend, Indiana, and 175 tons for a garage to be built for Dammon Brothers, Benton, Ill. Tentative plans for the bank building to be erected in Chicago for the Merchants' Loan & Trust Co. and the Illinois Trust & Savings Bank, which recently merged, provide for a monumental structure requiring 15,000 tons of steel. The Inter Ocean Building, Chicago, has been purchased by a syndicate which plans to replace it with a hotel.

The mill quotation is 2.45c. Pittsburgh, which takes a freight rate of 27c. per 100 lb. for Chicago delivery. Jobbers quote 3.47c. for material out of warehouse.

Bars.—Agricultural implement manufacturers have commenced to place orders for their last half requirements of mild steel and rail carbon bars. One implement concern has purchased 10,000 tons of steel bars and others are buying generously. The demand for bars for reinforcing purposes is steadily increasing. Bar iron remains dull. The railroads continue to buy only for urgent needs. One more mill in this district, in addition to the two mentioned last week, has raised its quotation on bar iron from 2.50c. to 2.62c., Chicago.

Mill prices are: Mild steel bars, 2.35c. Pittsburgh, taking a freight rate of 27c. per 100 lb.; common bar iron, 2.50c. to 2.62c. Chicago, rail carbon, 2.45c. mill. Jobbers quote 3.37c. for steel bars out of warehouse.

Plates.—The demand, although not heavy, is better than it has been for a protracted period. Considerable business is emanating from the southwest, where fabricators are building tanks for the oil fields. The ship yards are showing greater interest in plates. Now that restrictions on ship construction for foreign countries have been removed, it is expected that American yards will book work from abroad. There is also some demand for plates on the part of boilermakers and a few orders have been received from the railroads. The Government has reinstated 525 military cars for France which will be built by a local car builder.

The mill quotation is 2.65c. Pittsburgh, the freight to Chicago being 27c. per 100 lb. Jobbers quote 3.67c. for plates out of stock.

Sheets.—There is a healthy demand from various sources, including jobbers, fabricators, roof makers and miscellaneous manufacturers. Specifications are being received for two and three months ahead and an increasing number of buyers are closing contracts for last half requirements. One interest has received an order from Cuba and additional export business is expected. Mill operations are good.

Mill quotations are 4.35c. for No. 28 black, 3.55c. for No. 10 blue annealed, and 5.70c. for No. 28 galvanized.

Jobbers quote Chicago delivery out of stock: No. 10 blue annealed, 4.57c.; No. 28 black, 5.37c., and No. 28 galvanized, 6.72c.

Wire Products.—The aggregate volume of business continues to increase, although the demand for barbed wire has fallen off somewhat because the farmers are now busy in the fields. Purchases of nails, on the other hand, are larger, evidently reflecting the expansion in building activity. The prospect of an early advance in prices has encouraged buyers in increasing numbers to close contracts for their future requirements. For mill prices, see finished iron and steel f. o. b. Pittsburgh, page 66.

Rails and Track Supplies.—The leading interest has received orders for 1200 tons of rails from an independent steam line and 400 tons from an electric road. Hand to mouth purchases of track supplies continue the rule.

Standard railroad spikes, 3.35c. Pittsburgh. Track bolts with square nuts, 4.35c. Pittsburgh. Steel tie plates and iron angle bars, 2.75c. Pittsburgh and Chicago; tie plates, iron, 2.75c. f. o. b. makers' mills. Light rails, 2.45c. f. o. b. makers' mills, with usual extras.

Bolts and Nuts.—Prices of bolts and rivets were advanced to-day from 5 to 10 per cent. For mill prices see finished iron and steel, f. o. b. Pittsburgh, page 66. Jobbers quote:

Structural rivets, 4.72c.; boiler rivets, 4.82c.; machine bolts up to $\frac{3}{8}$ x 4 in., 50 and 10 per cent off; larger sizes, 40 and 10 off; carriage bolts up to $\frac{3}{8}$ x 6 in., 50 and 5 off; larger sizes, 40 off; hot pressed nuts, square tapped and hexagon tapped, \$2 off; coach or lag screw, gimlet points, square heads, 50 and 10 per cent off. Quantity extras for nuts are cancelled.

Cast Iron Pipe.—Akron, Ohio, has awarded 1000 tons to the United States Cast Iron Pipe & Foundry Co. and Lusk, Wyo., has let 500 tons to the American Cast Iron Pipe Co. The Lucas County Commissioners, Toledo, Ohio, have awarded 1000 tons of 6 and 8-in. pipe to a local contractor who will sublet to a pipe manufacturer. Laurel, Neb., has let 120 tons to the United States Cast Iron Pipe & Foundry Co.

We quote per net ton, f. o. b. Chicago, ex-war tax, as follows: Water pipe, 4-in. \$54.80; 6-in. and larger, \$51.80; class A and gas pipe, \$1 extra.

Old Material.—Buying is still confined largely to dealers. Railroads and Government lists are being rapidly absorbed at steadily advancing prices. The market is characterized by an unusual situation, the consumers are reluctant about buying because they consider prices too high and the dealers are disinclined to sell because they look for further advances. The Ordnance Department is asking for bids on 3200 tons of 8-in. squares with round corners, lying in the yards of the Standard Forging Co., Indiana Harbor, Ind. The Chicago, Milwaukee and St. Paul has issued a list of 1200 tons. The New York Central is asking figures on an open list and the Burlington is offering a few hundred tons of Government material.

Per Gross Ton

We quote delivery in buyers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

Iron rails	\$21.00 to \$22.00
Relaying rails	35.00 to 45.00
Carwheels	22.50 to 23.50
Steel rails, rerolling	21.50 to 22.00
Steel rails, less than 3 ft.	20.50 to 21.00
Heavy melting steel	17.50 to 18.50
Frogs, switches and guards cut apart.	17.50 to 18.50
Shoveling steel	17.50 to 18.00

Per Net Ton

Iron angles and splice bars	\$19.00 to \$20.00
Steel angle bars	17.00 to 17.50
Iron arch bars and transoms	23.00 to 24.00
Iron car axles	28.50 to 29.50
Steel car axles	25.50 to 26.00
No. 1 busheling	16.00 to 16.50
No. 2 busheling	11.50 to 12.00
Cut forge	16.50 to 17.00
Pipes and flues	14.70 to 14.50
No. 1 railroad wrought	17.00 to 18.00
No. 2 railroad wrought	16.50 to 17.00
Steel knuckles and couplers	17.50 to 18.00
Coil springs	20.00 to 20.50
No. 1 cast	22.00 to 23.00
Boiler punchings	19.50 to 20.00
Locomotive tires, smooth	17.50 to 18.00
Machine shop turnings	7.50 to 8.00
Cast borings	10.00 to 11.00
Stove plate and light cast	17.50 to 18.50
Grate bars	17.00 to 17.50
Brake shoes	16.00 to 17.00
Railroad malleable	17.00 to 18.00
Agricultural malleable	16.50 to 17.00
Country mixed	13.00 to 14.00

Philadelphia

PHILADELPHIA, July 1.

While there is a gradual improvement in steel business, it is not in the direction of heavy tonnages. Such products as plates and shapes show nothing yet of the betterment that must take place if mills are to be operated even on a moderately satisfactory basis. One Eastern plant whose rolling capacity is largely in plates was down to a 25 per cent operating basis last week, and this is indicative of the condition generally of the Eastern plate mills. Some improvement has been noted in the demand for structural shapes, but none of the mills in this district are able to run more than about 50 or 60 per cent of capacity. The demand for bars is much better than for other products. A western Pennsylvania plant is running almost full in its bar department; also in its wire department, wire business being conspicuously good. This territory has contributed a fairly good amount of business also in pipe. The weakness of the market lies in the absence of demand for products which ordinarily take the largest tonnages.

Specialties are in good demand, as noted by the sale of 2000 tons of spring steel for delivery over the remainder of the year; a contract has also been closed for 2400 tons of special sash sections, and a number of orders from the Detroit district for special automobile sections last week totalled 1600 tons. One company reports the sale of 4000 tons of light rails, 1500 tons of which was for export, and another producer has sold 1000 tons of light rails to a Philadelphia user for delivery over the remainder of the year. A Pittsburgh mill has made a price of 2.20c. on light rails, a reduction of \$5 a net ton, which other makers have been forced to meet in some instances.

There is some weakness in foundry pig iron due to the anxiety of one or two furnaces to book enough orders to maintain operation. Sales of No. 2 X have been made at \$28, furnace, and another furnace which will go in blast shortly will sell at \$29 or less, Philadelphia, for No. 2 X. An Eastern plate maker has paid \$26, furnace, for 6000 or 7000 tons of basic.

The scrap market gains in strength, a large tonnage of No. 1 heavy melting steel having been bought by an Eastern steel company at \$18.50 and \$18.75, delivered. Higher prices are asked by some dealers.

Pig Iron.—About 15,000 tons of foundry iron analyzing 2.25 to 2.75 per cent silicon has been quietly sold within the past two weeks by an Eastern Pennsylvania furnace at \$28, f. o. b. furnace. This interest has now withdrawn from the market, having taken all the business it cares to book for the present. Another furnace which will be blown in on foundry iron shortly is offering its output at prices approximating \$29, delivered Philadelphia, for No. 2 X, and there are unconfirmed reports of sales of this grade at \$28 and \$28.50 delivered at eastern Pennsylvania consuming points. Some furnaces with well established brands are obtaining \$30 or more, delivered, for No. 2 X iron. A few furnaces are making a differential of only 10c. a ton on No. 2 plain, and some are not attempting to sell No. 2 plain, preferring orders for the higher silicon iron. The views of several leading sellers are that prices of foundry iron will go higher, but a factor which will tend to prevent any marked increase within the near future is the disposition of several operators to light their furnaces as soon as business becomes available, and to obtain sufficient orders they may make slight concessions in prices. Inquiry for foundry iron has fallen off, and the market during the past week has been quiet. One sale of basic iron, amounting to 6000 or 7000 tons, was made by a Delaware River furnace to a maker of plates at \$26, furnace, there being no freight rate except a small switching charge. Basic iron for delivery in eastern Pennsylvania is somewhat firmer, but can be obtained at about \$26, delivered Philadelphia or vicinity. Sales of standard low phosphorus iron totalling 1500 tons have been made within the past week at \$38, f. o. b. furnace. Recent sales of copper bearing low phosphorus iron were made on the basis of \$35, furnace. Malleable is holding firm at \$27.25, Pittsburgh or Buffalo, or \$31.15, delivered Phil-

adelphia. Gray forge iron can be had at about 50c. a ton below the price of basic, but sales have been made as high as \$28, delivered. Only three of the 18 stacks in Virginia are in blast. One Virginia producer has sold 43 per cent of its output for the remainder of the year. We quote standard grades of iron for delivery in eastern Pennsylvania as follows, except that low phosphorus iron is quoted f. o. b. furnace:

Eastern Penna. No. 2 X (2.25 to 2.75 sil.)	\$29.00 to \$30.00
Eastern Penna. No. 2 plain (1.75 to 2.25 sil.)	28.50 to 29.60
Virginia No. 2 X (2.25 to 2.75 sil.)	30.60
Virginia No. 2 plain (1.75 to 2.25 sil.)	29.60
Basic	\$26.00 to 26.50
Gray forge	25.50 to 26.00
Malleable	31.15
Standard low phosphorus (f. o. b. furnace)	35.00
Copper bearing low phosphorus (f. o. b. furnace)	35.00

Ore.—A cargo of Brazilian manganese ore of 3700 tons, valued at \$115,440, arrived at Philadelphia last week. Ore importers are apparently taking little interest in bills now before Congress to levy a heavy import duty on manganese ore. The imports provided in some of these bills are so high that it is believed they will defeat themselves.

Ferrolloys.—Although producers of ferromanganese have resumed quoting \$125 on 78 to 82 per cent ferromanganese, no business is being done at this price. The tonnages recently sold at \$110 took out of the market about all of the active inquiries. Consumers have but little confidence in the \$125 price and any new business transacted will probably be on a lower basis, especially as one British interest has lowered its price for shipment to this country to \$115, Atlantic seaboard. Another British producer is expected to announce a lower price soon. Resale ferromanganese seems to have disappeared entirely. There is no interest in spiegeleisen, which probably could be obtained at about \$30 a ton, furnace, for the 18 to 22 per cent.

Semi-Finished Steel.—A maker of forgings has inquired for 2000 tons of open-hearth rerolling billets to be used for forgings. Several makers of billets decline to sell billets for forging use at the rerolling billet price, but it is known that such sales have been made, though the seller has refused to guarantee the suitability of the billets for forging purposes. Rerollers are buying in small lots, and the market is not active. Inquiries from the Pittsburgh district for sheet bars include one for 2500 tons monthly over the remainder of the year and another for 1000 tons monthly for the same period. We quote 4 x 4 in. open-hearth rerolling billets at \$42.50; forging billets at \$54 and slabs at \$45, delivered Philadelphia.

Rails.—Expected inquiry from the Railroad Administration for another large tonnage of heavy rails has not yet developed. One Pennsylvania maker is still quoting \$55 for Bessemer and \$57 for open-hearth, but of course is taking no business at these prices. There is some interest in light rails. One company has taken two domestic orders totalling 2500 tons and a 1500-ton order for shipment to Manila, P. I. A Pittsburgh maker has cut the price of light rails \$5 a ton, and other makers have in some instances met this quotation both on domestic and export business. A Philadelphia company has bought 1000 tons of light rails for delivery over the rest of the year. We quote light rails at 2.20c. to 2.45c., Pittsburgh.

Plates.—The plate market continues to be very dull. One Eastern plant whose rolling capacity is largely in plates was down to a 25 per cent operation last week. Several plate mills are idle. Locomotive orders show some improvement, the Baldwin works having closed for 60 engines for export, this being the total of a number of small orders. The Texas & Pacific Railroad and the Boston & Maine Railroad is each in the market for 25 locomotives. The Chester Shipbuilding Co., Chester, Pa., is figuring on two more 12,000-ton boats, which will take about 8000 tons of steel. We quote sheared plates ¼ in. and heavier at 2.895c., Philadelphia.

Structural Material.—The local building market is not active so far as large projects taking steel are con-

cerned. Fabricators are figuring on many jobs, most of which are for other localities. We quote plain material at 2.695c., Philadelphia.

Bars.—A leading seller of bars reports its total sales for last week were slightly over 5000 tons, which is nearly up to its capacity. Much of this business was in special bars, the demand for merchant steel not being on a par with orders for the specialties. Bar iron business is not active. We quote soft steel bars and bar iron at 2.595c., Philadelphia; double refined bar iron being 1c. a lb. higher.

Sheets.—Business in sheets in this territory is not up to the average established in other districts within the past few weeks. Some sellers report demand as decidedly slack. Some of the mills which were selling blue annealed sheets of gages 10 to 12 on a plate basis have discontinued this practice. One plate maker, however, will sell tank steel in those gages on the plate basis provided that specifications include other kinds of steel. We quote No. 10 blue annealed sheets at 3.795c.; No. 28 black at 4.595c. and No. 28 galvanized at 5.945c., all Philadelphia.

Old Material.—An Eastern steel company which a week ago came into the market for 5000 tons of No. 1 heavy melting steel has bought a tonnage considerably in excess of this amount and paid \$18 and \$18.75, delivered. Some of the bids received were as high as \$20 and \$21. Dealers continue to be firm in their views as to prices. Some of the high bids recently put in by dealers for shell steel offered by the Government are accounted for by the fact that they expect to sell at least a part of such tonnages as low phosphorus melting scrap, now quoted in this market at \$23 to \$24, delivered, when guaranteed to be 0.04 or under in phosphorus. The question is raised as to whether there will be a sufficient market for all of this material as low phosphorus scrap, but the probability is that the dealers who bought will hold the shell steel until a market develops. We quote for delivery at consumers' works in eastern Pennsylvania as follows:

No. 1 heavy melting steel	\$18.50 to \$18.75
Steel rails, rerolling	18.50 to 19.50
No. 1 low phosphorus, heavy, 0.04 and under	23.00 to 24.00
Iron rails	23.00 to 24.00
Carwheels	23.00 to 24.00
No. 1 railroad wrought	23.00 to 24.00
No. 1 yard wrought	21.00 to 22.00
Country yard wrought	12.00 to 15.00
No. 1 forge fire	13.50 to 14.00
Bundled skeleton	13.50 to 14.00
No. 1 busheling	15.00 to 16.00
No. 2 busheling	13.00 to 14.00
Turnings (short shoveling grade for blast furnace use)	12.50 to 13.50
Mixed borings and turnings (for blast furnace use)	11.50 to 12.00
Machine-shop turnings (for rolling mill and steel works use)	12.50 to 13.50
Cast borings (clean)	13.00 to 14.00
No. 1 cast	22.00 to 23.00
Grate bars	18.00 to 19.00
Stove plate	18.00 to 19.00
Railroad malleable	18.00 to 19.00
Wrought iron and soft steel pipes and tubes (new specifications)	18.50 to 19.50
Ungraded pipe	13.00 to 14.00

Buffalo

BUFFALO, June 30.

Pig Iron.—Buying for the week has not been of as good volume as for the previous week, which also showed something of a drop in total tonnage from the notably heavy purchasing of the preceding three weeks. There is still sufficient inquiry coming before the market, however, to keep up the interest of producers, being largely for third and fourth quarter delivery. Some of it is for high silicon and special irons, but the bulk is for regular foundry grades. One interest reports orders aggregating 8000 tons of foundry grades, in small lot tonnages. Shipments continue to go out from furnaces at a good rate, indicating that current business of foundries is increasing. Many shipments to tide-water and eastern New York points are now going out via the New York State barge canal. All interests maintain they are selling at prices not lower than the

March 21 schedule, and one interest states it is maintaining the advance of 25c. per ton on the two lower silicon grades that it established two weeks ago. Taken as a whole, the situation for the future is regarded as very favorable. We continue to quote the schedule reported last week, f.o.b. furnace, Buffalo, as follows:

No. 1 foundry, 2.75 to 3.25 silicon.....	\$29.75
No. 2X, 2.25 to 2.75 silicon.....	28.00
No. 2 plain foundry, 1.75 to 2.25 silicon.....	\$26.25 to 27.00
Gray forge.....	25.75 to 26.00
Malleable, silicon not over 2.25.....	27.25
Basic.....	25.75
Basic, 1 to 1½ per cent manganese.....	26.25
Basic, 1½ to 2½ per cent manganese.....	26.75
Bessemer.....	27.95
Lake Superior charcoal, regular grades, f.o.b. Buffalo.....	32.35

Finished Iron and Steel.—The week has shown continued activity in wire products and increasing activity in specifications for tubular goods, together with a greater volume of contracting for hot-rolled products and cold-finished steel. In several instances, it is reported contracts have been taken through to the end of the year on business that was especially desirable and from customers on the preferred lists of the steel companies taking the business. Several selling agencies report they are turning down specifications for wire products because of inability to ship material during the third quarter. Mills are limiting orders to the most desirable material and for shipment at their convenience. Business in reinforcing bars is brisk with an increasing volume of inquiry and some contracts of fairly good size placed and others in prospect. The John W. Cowper Co., Buffalo, has the general contract for the erection of a machine shop and storage building for the Rogers-Brown Iron Co., at its South Buffalo plant, requiring about 200 tons of structural steel. The Canadian demand for machinery, machine tools, motors and railroad equipment is strong and the outlook for increased business in these lines is very promising.

Prices f.o.b. Buffalo are as follows: Steel bars, 3.40½c.; iron bars, 4.10½c.; shapes, 3.50½c.; plates, 3.70½c.; No. 10 blue annealed sheets, 4.60½c.; No. 28 black, 5.65½c.; No. 28 galvanized sheets, 7.00½c. For "store door delivery" add 0.04½c. to each commodity.

Old Material.—A "dealers' market," principally, summarizes the situation in the Buffalo district. The demand from local consumers of scrap is very light and there is a falling off in inquiry noted from territory outside the district. Consequently, dealers constitute about the only buyers. There is no lack of optimism on the part of dealers, however, and they are adding to their yard stocks freely, confident that prices will advance. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel, regular grades.....	\$16.50 to \$17.00
Low phosphorus, 0.04 and under.....	21.00 to 22.00
No. 1 railroad wrought.....	20.00 to 20.50
No. 1 machinery casts.....	22.50 to 23.00
Iron axles.....	26.00 to 27.00
Steel axles.....	26.00 to 27.00
Carwheels.....	22.50 to 23.50
Railroad malleable.....	19.00 to 20.00
Machine shop turnings.....	8.00 to 9.00
Heavy axle turnings.....	13.00 to 14.00
Clean cast borings.....	11.50 to 12.50
Iron rails.....	23.00 to 24.00
Locomotive grate bars.....	19.00 to 20.00
Stove plate.....	19.00 to 20.00
Wrought pipe.....	15.00 to 16.00
No. 1 busheling.....	14.00 to 15.00
Bundled sheet stamping.....	12.00 to 13.00

Cincinnati

CINCINNATI, July 1.

Pig Iron.—Norton furnace at Ashland, Ky., will blow in soon on foundry iron and in anticipation of this event a considerable tonnage has been sold by the company operating the furnace for last half shipment. Last week sales of foundry iron from all districts were very encouraging, but the inquiry has fallen off and this week opened with comparatively little business in sight. Southern furnaces are fairly well sold up through the third quarter and furnaces in the Ironton district are also comfortably fixed for the next few months. Prices are firming up steadily and while

some Southern foundry iron analyzing 1.75 to 2.25 silicon can be obtained for prompt shipment around \$24.50 Birmingham, the tonnage to be had is limited and \$25 is considered the minimum for any considerable shipment this year. Order books of selling agencies for last week contained a number of 500-ton contracts for last half shipment. Most of the customers were Ohio melters, although some Southern iron was sold in Indiana. A round lot of Southern Iron was also sold to a Michigan melter for this year's shipment. Lake Superior charcoal iron is fairly active, but only small lots of malleable were sold in this vicinity during June.

Based on freight rates of \$3.60 from Birmingham and \$1.80 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, silicon, 1.75 to 2.25 (base price).....	\$28.10 to \$28.60
Southern coke, silicon, 2.25 to 2.75 (No. 2 soft).....	29.60
Ohio silvery, 8 per cent silicon.....	42.05
Southern Ohio coke, silicon, 1.75 to 2.25 (No. 2).....	28.55
Basic, Northern.....	27.55
Standard Southern carwheel.....	51.60
Malleable.....	29.05
Lake Superior charcoal.....	32.35 to 33.35

Coke.—A better demand for foundry coke is reported and producers in the Connellsville field seem inclined to advance quotations, but no general movement has yet been made. Foundry coke in that district is very firm around \$5.50 to \$5.75 per net ton at oven. Pocahontas 72-hr. coke remains around \$6 to \$6.50, but Wise County producers have practically withdrawn from the market for the time being. There is not much activity in furnace coke, although a few orders for Connellsville 48-hr. coke for shipment this year has been placed around \$4.25 at oven.

High-Speed Steel.—Standard brands of high-speed steel have been reduced to \$1.50 per lb., being a cut of 10c. a lb. Business is reported by selling agencies as being very good for this season of the year.

Finished Material.—The jobbers report business as improving and there is a steadily increasing demand for structural shapes and reinforcing concrete rods. Galvanized sheets are also wanted, and purchases made at the present time nearly all call for prompt shipment, thus showing that stocks in consumers' hands must be very low. In the face of the reported mill advance the jobbers are sticking to \$3.75 per keg base for wire nails, although some of them believe that prices will be marked up within the near future.

The following are present local jobbers' prices: Steel and iron bars, 3.33c. base; bands, 4.03c. base; structural shapes, 3.43c. base; plates, ¼-in. and heavier, 3.63c. base; No. 10 blue annealed sheets, 4.53c., and wire nails, \$3.75 per keg base.

Old Material.—Nearly all grades of scrap registered an advance last week, and business is reported to be improving by nearly all dealers. There is an urgent demand for rerolling steel rails and also for No. 1 railroad wrought scrap. The service division of the Ordnance Department sold a local scrap dealer last week 3000 tons of 3¼-in. steel rounds stored at Dayton, Ohio, at \$27.21 per gross ton. A lot of 1500 tons at 155 mm. shell forgings was taken by a Cleveland dealer at \$18.25 per gross ton, Middletown, Ohio. Bids were rejected by Washington on 4700 tons of 5½-in. gothic squares, the highest bid being \$20.60 per gross ton, Middletown. The following are dealers' buying prices f.o.b. at yards, in carload lots, southern Ohio and Cincinnati:

Per Gross Ton	
Bundled sheet.....	\$11.00 to \$11.50
Old iron rails.....	22.50 to 23.00
Relaying rails, 50 lb. and up.....	40.00 to 41.00
Rerolling steel rails.....	18.50 to 19.00
Heavy melting steel.....	14.50 to 15.00
Steel rails for melting.....	14.50 to 15.00
Old carwheels.....	18.50 to 19.00
No. 1 railroad wrought.....	16.00 to 17.00
Per Net Ton	
Cast borings.....	\$7.00 to \$7.50
Steel turnings.....	6.00 to 6.50
Railroad cast.....	19.00 to 19.50
No. 1 machinery.....	20.00 to 21.00
Burnt scrap.....	12.00 to 12.50
Iron axles.....	24.00 to 25.00
Locomotive tires (smooth inside).....	14.00 to 14.50
Pipes and flues.....	12.75 to 13.00
Malleable cast.....	13.50 to 14.00
Railroad tank and sheet.....	10.00 to 10.50

Birmingham

BIRMINGHAM, ALA., June 30.

Pig Iron.—There have been sales into fourth quarter of probably greater volume than is generally admitted in the Birmingham district. While books are not admittedly open, regular customers are being taken care of for that period. The leading interest is credited with being out of the market after having made bookings taking good care of the last half. There is a report of slight advances on metal sold for fourth quarter, but no instance has come to the surface. One company booked at the rate of 1000 tons per day during the week. All agree that the demand is steady. It is reported by one good authority that as low as \$23.90 was quoted for delivery in a strictly competitive field during the early period of the new buying movement. The Republic company will blow in an additional stack to care for influx of orders. Ironmasters note the delay with which cars are placed as indicating the beginning of a shortage. This they credit to the wheat movement and rather expect it to grow when cotton also moves. The American Radiator Co. has increased output capacity and the melt in the Southern field is rapidly increasing in volume. A leading foundry iron seller is credited with continuing to play the waiting game and selling very little at present price levels. The market is steady and seems to be hardening. We quote per gross ton, f.o.b. Birmingham district furnace, as follows:

Foundry, 1.75 to 2.25 silicon.....\$24.75
Basic 23.75

Cast Iron Pipe.—Sanitary pipe shops are understood to have booked three months' capacity and to be declining more forward business at present prices. Gas and oil pipe are increasingly active, Texas interests sending in orders freely.

Old Material.—The scrap market has failed to reflect the price advance in the East, owing largely, perhaps, to dependence on the local consumers who were well supplied. Distinct betterment is not expected until September. Cast is the only item moving in quantities. We quote per gross ton. Birmingham district yards, prices to consumers, as follows:

Steel rails\$12.00 to \$14.00
No. 1 heavy steel 12.00 to 13.00
Cast iron borings 6.50 to 7.50
Machine shop turnings 6.50 to 7.50
Stove plate 15.00 to 16.00
No. 1 cast 20.00 to 22.00
Car wheels 20.00 to 22.00
Tramcar wheels 20.50 to 22.00
Steel axles 18.00 to 20.00
No. 1 wrought 12.50 to 13.00

St. Louis

ST. LOUIS, June 30.

Pig Iron.—The dullness of the pig iron market has continued during the week, with the buying confined to small lots for nearby and third quarter delivery. No disposition is apparent to enter into distant commitments on either side, although there is some indication of improvement in business in general. The entire industry is playing safe until there is a more active disposition all along the line before making any very pronounced steps. No further readjustments of prices have been made to meet competition.

Coke.—Some further renewals of contracts on the half yearly basis have been reported, but no large contracts have been entered into to change the general situation as to coke. Foundries are pretty well covered for the new period and no great life is expected in the market until the general iron and steel situation becomes more definitely settled.

Finished Iron and Steel.—Finished products continue to show an improving demand, but this call is mostly for nearby delivery or for material out of stock. In consequence the warehouses are getting the most of the business as the need is for immediate use rather than for future contracts. However, the grand total of business is better and there are renewed evidences

that the building industry is slowly reviving and that the late summer and early fall will see further gains. For stock out of warehouse we quote as follows:

Soft steel bars, 3.44c.; iron bars, 3.44c.; structural material, 3.54c.; tank plates, 3.74c.; No. 8 blue annealed sheets, 4.59c.; No. 10 blue annealed sheets, 4.64c.; No. 28 black sheets, cold rolled, one pass, 5.44c.; No. 28 galvanized sheets, black sheet gage, 6.79c.

Old Material.—The scrap market continues to be a dealer's market. As is usual at the end of the month there have been no lists worth considering put out. All lists which have been out during the last half of the month have gone at good prices. We quote dealers' prices f.o.b. customs works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails	\$22.50 to \$23.00
Old steel rails, rerolling	19.50 to 20.00
O'd steel rails, less than 3 ft.	17.50 to 18.00
Relaying rails, standard sections, sub- ject to inspection	34.00 to 37.00
Old carwheels	23.50 to 24.00
No. 1 railroad heavy melting steel..	17.50 to 18.00
Heavy shoveling steel	14.50 to 15.50
Ordinary shoveling steel	13.50 to 14.00
Frogs, switches and guards, cut apart	18.00 to 18.50
Ordinary bundled sheets	10.00 to 10.50
Heavy axle and tire turnings.....	12.50 to 13.00

Per Net Ton	
Iron angle bars	\$16.50 to \$17.00
Steel angle bars	15.50 to 16.00
Iron car axles	30.00 to 30.50
Steel car axles	29.00 to 29.50
Wrought arch bars and transoms....	21.00 to 21.50
No. 1 railroad wrought.....	16.50 to 17.00
No. 2 railroad wrought.....	15.75 to 16.25
Railroad springs	15.50 to 16.00
Steel couplers and knuckles.....	15.50 to 16.00
Locomotive tires, 42 in. and over, smooth inside	17.00 to 17.50
No. 1 dealers' forge	12.50 to 13.00
Cast iron borings	9.50 to 10.00
No. 1 bushelling	15.00 to 15.50
No. 1 boiler cut to sheets and rings	14.00 to 14.50
No. 1 railroad cast	21.50 to 22.00
Stove plate and light cast.....	16.00 to 16.50
Railroad malleable	15.00 to 15.50
Agricultural malleable	14.00 to 14.50
Pipes and flues.....	14.00 to 14.50
Heavy railroad sheet and tank.....	13.50 to 14.00
Railroad grate bars.....	15.00 to 15.50
Machine shop turnings	9.00 to 9.50
Country mixed	13.50 to 14.00
Uncut railroad mixed	15.00 to 15.50
Horseshoes	18.50 to 19.00

New York

NEW YORK, July 1.

Pig Iron.—That some bankers' who entertain optimistic views in regard to the general condition of business are willing to buy pig iron for speculative purposes has been indicated by some inquiries made at pig iron offices during the past few days. While nothing definite has been done so far, there is a possibility that a round tonnage may be purchased. The last buying of this kind was done about five years ago at from \$13 to \$14. The market continues extremely quiet with \$27, Buffalo, for No. 2X and \$28 eastern Pennsylvania for the same grade as the lowest quotations. One Buffalo company, recently credited with selling basic at \$23, has withdrawn all general quotations and will sell, if at all, at considerably higher than prices recently named. There is very little activity on the part of Virginia furnaces and limited sales by Pennsylvania stacks, which vary considerably in their quotations. Inquiries include 1500 tons of foundry grades for various points in New England. Export business is almost at a standstill at the present time, but the outlook is there will soon be lower ocean freight rates. One sale was of 250 tons for shipment to the Dutch East Indies. We quote as follows, delivered New York, for Northern and Southern grades, quotations on the latter being nominal:

No. 1 foundry, silicon, 2.75 to 3.25..\$31.55 to \$31.80
No. 2 X, silicon, 2.25 to 2.75..... 29.80 to 30.80
No. 2 plain, silicon, 1.75 to 2.25..... 28.55 to 29.80
No. 2 X, Virginia, silicon, 2.25 to 2.75 31.40 to 31.90
No. 1 Southern, silicon, 2.75 to 3.25..... 32.45
No. 2 Southern, soft (all rail), sil., 2.25 to 2.75 30.70
No. 2 Southern (all rail), sil., 1.75 to 2.25.... 29.45

Ferroalloys.—It develops now that in the competition for ferromanganese business, noted last week, between 5000 and 6000 tons was sold at \$110, delivered. Since then there have been practically no inquiries unless it be one for 1200 tons which has been before the market for some time from a Middle Western consumer, but which may have been withdrawn. The only important development in the last week has been a reduction by the British producers from \$121, seaboard, to \$115, seaboard. American producers seem to be generally quoting \$125, delivered, but it is believed that an active demand would bring a concession to at least the British price and possibly lower. It is stated that an offer of \$110 has been refused while the statement is also made that some producers are quoting \$110, delivered. The spiegeleisen market is still inactive, but there is a little more inquiry, one of about 1000 tons and another of 500 tons being noted. In the absence of any test of the market quotations are nominally higher at \$35, furnace, for 18 to 22 per cent material. The market for 50 per cent ferrosilicon is a little more active, one inquiry for 150 tons for July-August delivery being reported. Quotations are firm at \$75 to \$80, delivered. The British price, according to the latest information, is £25 (\$114.50) per ton, basis 50 per cent, with a scale up or down of 8s. 6d. (\$1.90) per unit. French made 76 to 80 per cent ferromanganese has been selling at \$170 per ton, f.o.b. furnace. Quotations for ferrotungsten are difficult to obtain in the absence of any real test of the market. Ferrochrome, 60 to 70 per cent, carload lots, is nominal at 32c. to 34c. per lb. of contained chromium, depending on carbon content. In small lots 2c. per lb. more is added. Ferrochrome, carbon free, 60 per cent chromium, is obtainable at 70c. per lb. of alloy. Ferrovanadium is quoted at \$6 per lb. of contained vanadium in wholesale lots for early delivery. Ferrocobalt-titanium, 15 to 18 per cent, is selling at \$200 per net ton in carload lots, at \$220 per ton in lots between one ton and a carload, and at \$250 per ton in lots less than a ton, f.o.b. Suspension Bridge, N. Y.

Finished Iron and Steel.—Domestic business in June was considerably in excess of any month this year. One of the largest independent producers reports that its bookings in June were double those of May, but as May was perhaps the duller month of the year the gain is not as important on a tonnage basis as might be assumed. Structural lettings continue to indicate a fair gain in building construction and are in part as follows: The Harris Structural Steel Co., New York, 400 tons for Street & Smith at Fifteenth Street and Seventh Avenue, New York, and 400 tons for the F. W. Schwiens, Jr., Co. at Eleventh Avenue and Forty-eighth Street; American Bridge Co., 300-ton oil tank at Charleston, S. C., for the Standard Oil Co.; Ferguson Iron & Steel Co., Buffalo, 200-ton boiler plant extension for the Pierce-Arrow Motor Car Co., Buffalo. The Phelps Dodge Corporation, New York, is in the market for 1000 tons of steel for a copper plant in Arizona. This project was up two years ago but did not go ahead on account of the war. Prospects for additional locomotive building are said to be good. Inquiries from the Texas & Pacific and Boston & Maine for 25 locomotives each are held to be forerunners of buying of equipment by the individual roads rather than by the Railroad Administration. The Texas & Pacific is also in the market for 110 tank cars. Eastern steel companies declare they are being discriminated against by the Railroad Administration, which has advised Eastern railroad purchasing agents to buy steel from Pittsburgh mills because Eastern mills will not quote on an f.o.b. mill basis. The railroad attitude is that if they must pay to Eastern mills the Pittsburgh prices plus the freight they may as well get the benefit of the freight haul. There is very little plate inquiry in the market. Sellers do not credit reports that a leading interest will advance prices. The general opinion is that present steel prices will be generally maintained throughout the remainder of the year. We quote mill shipments as follows: Bar iron, refined grade, 2.62c.; double refined bar iron, 3.62c.; soft steel bars, 2.62c.; shapes, 2.72c.; plates, 2.92c.; all New York.

Export Trade.—No business that can be directly attributed to the signing of the treaty of peace has yet developed. June was the best month this year, but business is not gathering much momentum and inquiries for very large tonnages are missing. New York exporters hear that a Belgian mill has sold a large tonnage of rails to France in competition with England. American mills have succeeded in getting orders for special steel bars from Scandinavian countries, but it is believed that the Scandinavian market will not long be open to this country if Germany resumes selling steel soon, as seems to be expected. Much of the present export business comes from South America and the Far East. Japanese business, however, has not yet bulked as large as was expected. We note the sale of 1000 tons of steel bars to a South American country and an inquiry for 1000 tons of black sheets for Japan. An inquiry for several thousand tons of plates for Italy, mentioned last week, is still pending. Other wire companies have not followed the lead of the Jones & Laughlin Steel Co. in advancing export prices for wire products. Some shippers are seeking shipping space out of Philadelphia rather than from New York because the Pittsburgh-Philadelphia freight rate on finished steel is 50c. a ton lower than the Pittsburgh-New York rate. It is becoming much easier to get space to South America, some steamship companies being very anxious for shipments.

Warehouse Business.—Consumers are showing a growing disposition to stock up to a limited extent so that the advent of sizable contracts or orders will not find them unprepared to undertake manufacturing promptly. The prevailing tendency to place business on this basis has been the lever of late. Bars, shapes, blue annealed and cold-rolled black sheets are holding firm. A concession of \$1 a ton, however, is reported on one moderate order involving a structural section of which it is stated the warehouse was carrying an especially heavy stock. The sheet trade as a whole shows more life. One jobber is asking 20c. per 100 lb. increase on galvanized sheets, or 6.70c. base, but others still quote 6.50c. in small lots and 6.25c. in 25-bundle lots. The market for tin plate is stiffening and it is reported that surplus stocks have been cut down. Slack business continues in bolts and nuts, rivets, pipe and fittings. The small volume of actual business in these lines is believed to be the reason why the trade shows no disposition to meet the 50 per cent discount quoted by a leading interest on machine bolts $\frac{3}{4}$ x 4 in. up to 1 x 30 in., which will probably remain in effect until July 15, if not longer. We quote No. 10 blue annealed sheets, 4.57c.; No. 28 black sheets, 5.37c.; No. 28 galvanized sheets, 6.50c.; steel bars, 3.37c.; structural shapes, 3.47c.; plates, 3.67c.; bands 3-16 in., No. 10 and 12, 4.07c.; shafting, net list.

High-Speed Steel.—Mill schedules the past month have shown a slight improvement, which, if sustained, is expected to result in a fair business by fall. The trade locally is in many cases buying in small lots, even bits, a concomitant of a falling market. The decline in prices, however, is not marked or universal; but \$1.50 is representative of desirable business, less attractive orders fetching up to \$1.60 per lb.

Cast Iron Pipe.—Following the recent placing of about 1200 tons by the city of Boston at low prices, there has been very little business and no municipal contracts of importance have developed. There is a fair amount of private buying. We quote New York prices as follows: 6-in. and heavier, \$50; 4-in., \$53; 3-in., \$60, and \$1 additional for class A and gas pipe.

Old Material.—Heavy melting steel has jumped about \$1 in price within the last seven days and the demand for it has caused a sympathetic, though slighter, increase in other items. The report that an eastern Pennsylvania steel plant is offering as high as \$19 a ton for steel, delivered, is having its effect in this market. The fairly high prices being bid for Government scrap also tend to move the market up. A scrap firm with a New York office recently bid \$20.36, f.o.b. Morgan, N. J., for 2000 tons of mixed scrap, of which about 60 tons was copper wire. Consumers are beginning to

bid directly on the lists of scrap for sale issued by the railroads, which is also pointed out as a healthy indication. Prices which dealers and brokers are paying, New York, follow:

Heavy melting steel.....	\$15.00 to \$15.50
Rerolling rails.....	17.00 to 17.50
Relaying rails, nominal.....	40.00 to 41.00
Steel car axles.....	23.00 to 24.00
Iron car axles.....	27.00 to 28.00
No. 1 railroad wrought.....	20.50 to 21.00
Wrought iron track.....	15.00 to 15.50
Forge fire.....	10.00 to 10.50
No. 1 yard wrought, long.....	17.50 to 18.00
Light iron.....	8.00 to 9.00
Cast borings (clean).....	10.00 to 10.50
Machine shop turnings.....	10.00 to 10.50
Mixed borings and turnings.....	8.00 to 8.50
Iron and steel pipe (1 in. minimum diameter) not under 2 ft. long....	15.00 to 15.50
Stove plate.....	15.50 to 16.00
Locomotive grate bars.....	15.50 to 16.00
Malleable cast (railroad).....	14.00 to 14.50
Old carwheels.....	20.00 to 20.50

Prices which dealers in New York and Brooklyn are quoting to local foundries, per gross ton, are:

No. 1 machinery cast.....	\$21.50 to \$22.00
No. 1 heavy cast (columns, building materials, etc.), cupola size.....	20.50 to 21.00
No. 1 heavy cast, not cupola size.....	15.00 to 15.50
No. 2 cast radiators, cast boilers, etc.	16.50 to 17.00

Cleveland

CLEVELAND, July 1.

Iron Ore.—The ore market is fairly active and producers and sellers regard the situation as much brighter than a few weeks ago. During the week, an Eastern consumer purchased 60,000 tons of Lake Superior ore and two other sales of 50,000 tons each are reported. There have also been a number of sales of smaller lots. Some of the buyers are not covering for their full year's requirements, but are expected to come in the market later in the season for more ore to last them until next spring. Henry Ford has finally purchased a round tonnage of ore for his Detroit blast furnace, and this will be shipped from the ore docks of the Detroit Iron & Steel Co. The Weirton Steel Co., Weirton, W. Va., will blow in its blast furnace about July 17, and has commenced to take ore shipments. Shipments are increasing, but a few of the boats used in the ore trade have not yet been placed in commission this season. Ore prices delivered f.o.b., lower Lake ports, are as follows:

Old range Bessemer, \$6.45; old range non-Bessemer, \$5.70; Mesaba Bessemer, \$6.20; Mesaba non-Bessemer, \$5.55.

Pig Iron.—The pig iron market has slowed down considerably after three or four weeks of activity in foundry and malleable grades, during which a large share of the foundries in the Central West covered for their requirements for the last half. However, a fair volume of business came out during the week in lots up to 2000 tons. Conditions in the foundry trade show a marked improvement, and the better outlook is indicated by the fact that one Cleveland foundry that bought considerable iron recently placed an additional 1000 tons during the week. Among new inquiries is one from a north central Ohio implement manufacturer for 1000 tons and another from a nearby consumer for 2000 tons. The report of a sharp cut in price on the sale of 2000 tons of foundry iron to a Springfield, Ohio, consumer has aroused considerable interest among Cleveland sellers. While no denial is made that this iron went at a price considerably below the market, it is claimed that it was not taken by a Cleveland seller. There is little activity in steel-making iron. It is understood that the American Steel Foundries, which recently inquired for 2000 to 3000 tons of basic iron for its Alliance, Ohio, plant, will purchase a considerably larger tonnage, or enough to cover its requirements through October. An export inquiry for 1000 tons of Bessemer iron is reported. Silvery iron continues fairly active, and sales aggregating 1700 tons are reported. Southern iron is firmer and producers have discontinued absorbing the entire freight rate on high-silicon iron for shipment to northern Ohio points. However, some concessions can probably be secured on this iron.

Southern sellers who have been calling on the trade in Canada see little prospect of selling iron there at present, as the freight, duty, ad valorem tax and exchange bring the delivery price up to about \$40. During some years there is considerable high phosphorus Southern iron shipped to Canada. While the high import duties are not new, these did not shut out Southern iron when the domestic iron was higher in Canada than it is at present. We note the sale of 700 tons of low phosphorus iron of special analysis at \$40, furnace, for the last half. However, standard low phosphorus iron is being quoted as low as \$38. We quote, delivered, Cleveland, as follows:

Bessemer.....	\$29.35
Basic.....	26.15
Northern No. 2 foundry, silicon, 1.75 to 2.25.....	27.15
Southern foundry, silicon, 2.25 to 2.75.....	33.00
Gray forge.....	26.15
Ohio silvery, silicon, 8 per cent.....	42.65
Standard low phos., Valley furnace.....	\$38.00 to 40.00

Ferroalloys.—There has been a fair volume of activity in ferromanganese in this territory during the past week, several sales being made at the reduced price of \$110 delivered. It is stated that producers have now re-established the former price of \$125.

Finished Iron and Steel.—The volume of business in finished steel lines has increased and the tonnage involved in inquiries and current orders as a rule is larger than a few weeks ago. Activity is largely in steel bar products, for which the demand is very heavy. However, structural material is moving fairly well, but plates continue quiet. Many consumers are contracting for steel bars for the third quarter and last half, and some of the structural material consumers are covering for their requirements with contracts. Agricultural implement manufacturers are buying very freely for the last half, and are sending in specifications covering two or three months. The greatest volume of business is still from the automobile industry, and some consumers in this field are beginning to press the mills for deliveries. A fair volume of export inquiry for light rails is coming out. Some mills are still quoting 2.05c. for light rails rolled from shell steel. Building work is being projected in Cleveland in a large volume. The Fort Pitt Bridge Works has taken 700 tons for an addition to the plant of the Cleveland Metal Products Co. and 400 tons for a building for the Nurdyke & Marmon Co., Indianapolis. The demand for reinforcing bars is very heavy. There is still some shading of the 2.25c. price on hard steel reinforcing bars, and the \$1.50 per ton extra on deformed bars is being shaded on bars rolled from shell steel. A Cleveland shipyard is bidding on 30 concrete barges for the Government that will require 4500 tons of bars. Specifications on contracts for sheet bars and billets have improved materially, and demand for forging bars is fairly active. The demand for sheets has become brisk, and the sheet market is firmer, although price cutting has not yet disappeared. Warehouse business shows a decided improvement. Warehouse prices are as follows:

Steel bars, 3.27c.; plates, 3.57c.; structural shapes, 3.37c.; bands and hoops, 3.97c.; No. 10 blue annealed sheets, 4.47c.; No. 28 black sheets, 5.27c.; No. 28 galvanized sheets, 6.62c.

Coke.—There is a fair demand for foundry coke contracts, which in nearly all cases cover a period of only six months. Some Ashland County by-product coke is being sold in this territory on the basis of \$6, Connellsville, for delivery over a full year. We quote standard Connellsville foundry coke for delivery during the last half at \$5.25.

Bolts, Nuts and Rivets.—The improvement in the demand for bolts and nuts noted last week continues. There is a good volume of orders for immediate shipment, and considerable business is being booked in contracts for the last half. The demand for rivets has also improved, and some good orders are coming from Eastern shipyards. Many consumers are getting under contract for the last half. Prices are firm.

Old Material.—There is a fair volume of activity in the scrap market, but this is confined almost wholly to

transactions between dealers and is almost wholly in heavy melting steel, borings and turnings. Cleveland mills recently bought round tonnages of heavy melting steel, and all are now out of the market. Prices are firm. Mills will not pay over \$18.50 for heavy melting steel, that being the price at which much of the material was recently contracted for, but dealers are paying \$19, and in some cases slightly higher for this grade. Turnings are moving fairly well at \$10.50. A sale of low phosphorus melting scrap is reported at \$21. There is no activity in busheling scrap. We quote delivered consumers' yards in Cleveland and vicinity, as follows:

Heavy melting steel	\$18.00 to \$18.50
Steel rails, under 3 ft.	20.00 to 21.00
Steel rails, rerolling	19.50 to 20.50
Iron rails	24.00 to 25.00
Iron car axles	30.00 to 31.00
Steel car axles	28.50 to 29.50
Low phosphorus melting scrap.....	21.00 to 22.00
Cast borings	11.50 to 12.00
Iron and steel turnings and drillings.	10.00 to 10.50
Compressed steel	15.00 to 15.50
No. 1 railroad wrought	20.50 to 21.50
Cast iron carwheels	23.50 to 24.50
Agricultural malleable	16.50 to 17.50
Railroad malleable	18.50 to 19.00
Steel axle turnings	15.00 to 15.50
Light bundled sheet scrap.....	14.50 to 15.00
No. 1 cast	23.00 to 24.00
No. 1 busheling	15.50 to 16.00
Drop forge flashings, 10 in. and under	14.00 to 14.50
Drop forge flashings, over 10 in.....	11.75 to 12.00
Railroad grate bars	18.50 to 19.00
Stove plate	18.50 to 19.00

San Francisco

SAN FRANCISCO, June 24.

The past week has shown a gradual increase demand in nearly all materials. While business cannot yet be said to be brisk a very general feeling exists that conditions are favorable for a renewal of activity at an early date. This is especially noted in the materials used in buildings. As yet there has been very little new building work inaugurated, but an unusual inquiry about cast-iron soil pipe is taken as an indication that a renewal of construction work is under consideration by many people. Inquiry for cast-iron pipe is said to be much greater than at any time for the past five years. With the signing of the treaty of peace it is felt that many of these inquiries will be followed by orders.

Finished Materials.—The demand for re-inforcing bars continues to grow, and although it has not yet reached a large volume, every week shows substantial increases in the orders and inquiry. With plates and sheets there is no notable change in the situation. Four contracts about to be let for structural steel, totalling about 1400 tons, have given a stronger tone to this market than it has had for some time. The Government is advertising for bids for structural steel for two radio plants, each of about 170 tons, which are to be erected in South San Francisco. A third radio plant, which will require about 400 tons of structural steel, is to be built on the island of Guam. A fourth proposition for which the contract has already been let to a local contractor calls for 650 tons for a bridge over the Salinas river near King City, Cal. The situation in wrought pipe seems better than it has been for months. Gas and water companies all over the Coast are sending in inquiries about deliveries and it is understood that a good deal of new construction work is about to begin. A majority of these inquiries are coming from Oregon and Washington, especially from the former.

Cast Iron Pipe.—The inquiry for cast pipe continues to grow. Santa Monica let a contract for 175 tons of 8-in. pipe last week to the United States Cast Iron Pipe & Foundry Co., and several smaller tonnages were placed.

Pig Iron.—There is no demand for pig iron except in small quantities, and as long as scrap is available at anywhere near present offers, there is little likelihood of a demand developing.

Coke.—The users of coke in this market all have good supplies stored in their yards, and local dealers are also said to be well supplied. Until more work is

available for the foundries there is very little chance that there will be a material increase in the demand for coke.

Old Material.—The market for scrap remains in a somewhat chaotic condition, with no fixed prices and a wide divergence of opinion as to what the selling price should be. The mills continue to offer from \$12 to \$14 per gross ton, which some of the dealers assert is not enough to pay freight in getting the material to this market. Cast-iron scrap is less plentiful, according to the dealers who claim that the demand for this description is on the increase. Practically all the steel scrap on the Coast comes from the shipyards and railroads, and the dealers state that this source is not enough to take care of the demand at present, notwithstanding the curtailment of present consumption. On the other hand, mill men state that they are getting all the scrap they need.

British Prices Still Advancing

Belgian Bars Sold to India—American Billets Under British—Glasgow Takes American Rails
(By Cable)

LONDON, ENGLAND, June 30.

Steel prices are still tending upward. The pig-iron market is firm with more inquiry for forward shipment. The stringency in hematite iron is unabated and an advance is probable.

Belgian steel bars have been sold to India for early shipment at £16 15s. (\$76.71), f.o.t. Antwerp, and pig iron is reported to have been sold to the United Kingdom. Lorraine semi-finished steel has been offered at 400 fr. (\$61.80), f.o.b. Antwerp, but freight conditions are a check to business.

American 2-in. billets have been offered at £12 15s. (\$58.39), and 4-in. billets at £11 17s. 6d. (\$54.39). The Glasgow Corporation has bought 5000 tons of tram rails from the United States Steel Products Co. at £17 9s. (\$79.92), c.i.f., against a British tender of £19 1s. 3d. (\$87.33).

In galvanized sheets there is more business doing for India at £26 10s. (\$121.37) basis f.o.b. In tin plates there is more inquiry, basis about 33s. (\$7.55), f.o.b., America offering 31s. 9d. to 32s. (\$7.27 to \$7.32), c.i.f. Liverpool. The joint deputation of Welsh tin-plate makers and workmen leaves for America the third week in July. Welsh makers have made a successful offer for a fair line of 70-lb. tin plates for China, under-quoting American producers.

We quote per gross ton, except where otherwise stated, f.o.b. makers' works, with American equivalents figured at \$4.58 for £1:

Pig iron	£ s. d.	£ s. d.	
East Coast Bessemer. 9 10 0 to 9 12 6			\$43.51 to \$44.07
West Coast Bessemer. 9 5 0 to 9 10 0			42.36 to 43.51
Cleveland No. 3 foundry	8 0 0 to 8 5 0		36.64 to 37.78
Cleveland basic	8 2 6		37.21
Coke (Durham):			
Furnace	1 19 0		8.93
Foundry	2 4 0		10.07
Ferromanganese	25 0 0		114.50
Billets	14 10 0 to 14 15 0		66.41 to 67.55
Tin plate and sheet bars. 13 15 0			62.97
Rails, 60 lb. and upward	16 0 0		73.28
Steel bars	19 0 0 to 20 10 0		Cents per lb. 3.88 to 4.18
Large rounds, etc.	17 2 6 to 18 10 0		3.49 to 3.68
Structural material	17 0 0		3.47
Plates	17 15 0		3.62
Plates, boiler	19 10 0		3.98
Bar iron	21 0 0		4.29
Tin plates, 14 x 20, coke 1 13 0			\$7.55
112 sheets, 108 lb., f.o.b. Wales.			

French Iron and Steel Market

French iron and steel market conditions in early June were briefly as follows, according to a summary by *L'Usine*, Paris.

The difficulty of getting coal occasioned an almost complete stoppage of pig iron making in Lorraine, though in Westphalia there were important unengaged supplies of coke. The trade was hoping for energetic action on the part of the allied governments to require Germany to continue fuel shipments. However, French

blast furnaces were being put into blast one after the other. One group of pig iron makers has a price of 260 fr. (\$40) per ton for the second half, but first quality hematite is quoted at 330 fr. (\$50.75) and second quality at 320 fr. (\$49.25).

The operation of steel plants and rolling mills is checked by transportation difficulties and labor scarcity. American pressure is not felt so much probably because of the exchange situation. Small billets have sold at 48 fr. per 100 kg. (\$75.25 per ton) and machine wire at 63 to 64 fr. (\$4.40 to \$4.50 per 100 lb.)

Steel plants in the liberated regions are getting into operation. The plant of Lefort & Co., in the Ardennes, rolled the first sheet on May 26 and will allow for supplying factories in the district. It was expected that the first cast from the open-hearth plant would be made on June 10, a 25 ton furnace being started on June 2.

In the foundry trade a big demand has accumulated but the workers have, since May 1, given a diminished output and there are numerous strikes.

The needs for rolling stock are appearing. The railroads of the East have bought one lot of 1100 tons of cast steel journal boxes at 135.85 fr. per 100 kg. (9.5c. per lb.) and one lot of 3350 tons at about 200 fr. (14c. per lb.). They have also ordered 85 tons of locomotive boiler plates at 14c. per lb.

In machine tools extended deliveries for the needs of the devastated regions are lending interest to securing machines of foreign make. This is regarded as the reason for the announcement that the United States is awaiting the possibility of sending to France and Belgium \$75,000,000 worth of machine tools.

Trimble-Burgess Co. Organized

PITTSBURGH, July 1.—The Trimble-Burgess Co. has applied for a Delaware charter, with a capital of \$125,000, and will shortly open offices in the Woolworth Building, New York, to handle iron and steel products mainly for export, but the company will also do an importing business and in addition will do a domestic business in iron and steel. The officials are George L. Burgess, president; H. N. Trimble, vice-president, and L. N. Ralph, secretary and treasurer. Mr. Burgess for some years was in the sales offices of the Carnegie Steel Co., Pittsburgh, but for the past two or three years has been engaged in an export business in iron and steel, with offices in New York. Mr. Trimble is president of the H. N. Trimble Steel Co., Oliver Building, Pittsburgh, a large dealer in iron and steel scrap, and Mr. Ralph has resigned his position as vice-president of the H. N. Trimble Steel Co. to become secretary and treasurer of the Trimble-Burgess Co. Mr. Ralph was for some years in the billet and rail sales bureau of the Carnegie Steel Co. Later he was assistant secretary and assistant treasurer of the Ordnance Department of the United States Steel Corporation, which position he resigned to go with the H. N. Trimble Steel Co.

Entertained by Sizer Forge Co.

Three hundred representatives of the forge industry gathered in Buffalo on Monday of this week as the guests of the Sizer Forge Co., for the discussion of business and the promotion of good fellowship.

A meeting was held in the assembly room of the Iroquois Hotel in the morning and then the guests went with C. Breckenridge Porter, president of the Sizer Forge Co., to inspect the company's new plant at Larkin and Red Jacket Streets and the Lake Shore Railroad. It covers six acres and employs 600 men, with a capacity for production that is 10 times greater than that of the old plant. Another meeting for discussion and goodfellowship was held at the Iroquois in the evening.

The guests included C. W. Heppenstall, president of the Hennenstall Forge Co., Pittsburgh; R. A. Harmon, Cleveland City Forge Co.; R. E. Christie, Bethlehem Steel Co., and H. N. Taylor, Philadelphia, and a number of prominent Buffalonians.

IRON AND INDUSTRIAL STOCKS

Volume of Trading Less, but Prices Have Been Firm—Less Public Participation

NEW YORK, July 1.

The past week has been a relatively quiet one and for the first time in some 40 to 50 sessions less than 1,000,000 shares were traded in on two or three days. The market has partly marked time waiting the actual signing of peace, and conjectures have been rife as to just what course the market would take as a result. Thus far this week prices have been firm with a tendency to advance. Steel common has been strong with no sign of a reaction, and this has been true of other steel stocks. The better position in the copper market has been reflected in gradual improvement in the price of these stocks. The public has not been as active in the market and the professional phase has been predominant. Monday and Tuesday were again million shares days. The range of prices on active iron and industrial stocks from Tuesday of last week to Wednesday of this week was as follows:

Allis-Chalm., com. 41 - 45 3/4	La Belle Iron cm. 108 - 110
Allis-Chalm. pf. 94 - 96	Lackaw. Steel .. 81 3/4 - 86 1/4
Am. Can com. 55 - 62 3/4	Lake Sup. Corp. 19 3/4 - 20 1/4
Am. Can pf. 103 1/2 - 104 1/4	Lima Loco. 67 - 72 1/2
Am. C. & Fdy. cm. 108 - 112 1/4	Midvale Steel .. 51 - 52 1/2
Am. Loco com. 84 - 91 3/4	Nat.-Acme 37 3/4 - 38 1/2
Am. Radiator cm. — - 30 1/2	Nat. F. & St. cm. 76 3/4 - 82
Am. Ship com. 124 - 125	Nat. En. & St. pf. 109 1/4 - 110 1/2
Am. Ship pf. — - 90	N. Y. Air Brake 118 - 124
Am. Stl. Fdries. 40 - 44	Nova Scotia Steel 82 3/4 - 85
Ba'd. Loco. com. 102 1/4 - 109 1/4	Pressed Stl. com. 84 - 86 1/2
Ba'd. Loco pf. — - 107 1/4	Rv. Stl. Spg. cm. 90 1/4 - 93 3/4
Beth Steel. com. 85 1/4 - 88 3/4	Ry. St. Sng pf. — - 107 1/2
Beth Steel. Cl. B. 85 3/4 - 88 1/2	Republic com. .. 88 3/4 - 94 1/4
Case, J. I., pf. — - 100	Republic pf. 104 1/4 - 104 3/4
Cent. Fdry. com. 21 3/4 - 26 1/4	Sloss com. 67 1/4 - 73 1/2
Cent. Fdry. pf. 49 - 54 3/4	Sloss pf. 93 1/2 - 95
Chic. Pneu. Tool. 78 3/4 - 81 1/4	Superior Steel... 43 - 45 1/4
Colo. Fuel 47 - 49 1/2	Transue-Williams 56 3/4 - 57
Cru. Steel com. 90 1/8 - 97 3/4	Un. Alloy Steel.. 50 3/4 - 53
Cru. Steel pf. — - 101	U. S. Pipe com. 33 3/4 - 36 3/4
Gen. Electric ... 163 1/4 - 165 1/2	U. S. Pipe pf. 64 - 72 1/2
Gt. No. Ore. Cert. 45 - 47	U. S. Steel com. 105 3/4 - 109 3/4
Gulf States Steel 65 - 68 3/4	U. S. Steel pf. ... 115 1/2 - 116 3/4
Int. Har. com. 140 - 145 1/2	Va. I. C. & Coke. — - 67 1/2
Int. Har. pf. 119 1/4 - 119 3/4	Westing. Elec. 56 - 57 3/4

Dividends

The American Seeding Machine Co., quarterly, 1 per cent and extra 1 per cent on the common and 1 1/2 per cent on the preferred, payable July 1.

The American Shipbuilding Co., quarterly, 1 1/4 per cent and extra 1/4 per cent on the common and 1 1/4 per cent on the preferred, payable Aug. 1.

The Crucible Steel Co. of America, quarterly, 1 1/2 per cent on the common payable July 31.

The Pittsburgh Steel Co., quarterly, 2 per cent on the common, payable July 1.

The Superior Steel Co., quarterly, 3/4 per cent on the common, payable Aug. 1, and 2 per cent on the first and second preferred, payable Aug. 15.

The Wheeling Mold & Foundry Co., quarterly, 3 per cent and extra 1 per cent on the common, and 2 per cent on the preferred, payable Aug. 1.

Clinton-Wright Co. Quickly Financed

WORCESTER, MASS., June 30.—The financing of the Clinton-Wright Co., the combination of the Wright Wire Co. and Morgan Spring Co., of Worcester, and the Clinton Wire Cloth Co. of Clinton, Mass., has been completed by the public sale of the \$3,500,000 of first preferred stock. The amount was largely oversubscribed in a single day. Worcester's quota was by no means large enough to take care of the local subscribers. The total capitalization is \$12,500,000, divided between first preferred and \$1,500,000 of voting preferred and \$7,500,000 common.

George M. Wright, chairman of the board of directors, has issued a statement in which he points out as one of the results of the consolidation, "that the output of wire will be increased about 10,000 tons by reason of the fact that the Clinton plant has heretofore purchased elsewhere its supply of wire, which will now be manufactured in the Worcester and Palmer, Mass., plants of the company." The statement further says:

According to the approximate consolidated balance sheet prepared by Messrs. Marwick, Mitchell Peat & Co., the net quick assets of the company are not less than \$4,200,000. . . . For the past three years the net earnings after taxes and liberal allowance for depreciation have averaged over

\$1,000,000. The demand for the products is national in scope and is increasing rapidly. I estimate that the earnings of the company for the fiscal year ending June 30, 1920, will be in excess of \$1,500,000.

The Clinton Wire Cloth Co. was the pioneer manufacturer of woven wire cloth and screening and electrically welded wire fabrics, including wire fences and welded fabric for the reinforcement of concrete, and also a large manufacturer of perforated metal goods of wide variety. The plant in Clinton, with about 12 acres of floor space, is appraised at \$1,300,000.

The Morgan Spring Co. was the pioneer manufacturer of wire springs and a large manufacturer of wire, wire forms, wire hardware, wire kitchen goods and wire specialties of wide variety. The plants in Worcester, with about six acres of floor space, are appraised at \$1,300,000.

The Wright Wire Co. was one of the largest manufacturers of wire, wire rope, wire fences, wire cloth, wire screening and many other wire products. The plants in Worcester and Palmer, with about 18 acres of floor space, are appraised at \$4,475,000.

In addition to the eight Worcester directors of the new company, as published last week, the outside financial interests will be represented on the board by Harry Bronner, president of the Missouri Pacific Railroad, George F. Naphen of Liggett & Drexel, and Richard B. Young, vice-president of E. H. Rollins & Sons, all of New York. The treasurer and executive committee have not been named.

Chicago an Ocean Port

The Lake Grandby, a vessel built in Chicago, manned by a Chicago crew, and loaded with packing house products, sailed from Chicago direct for Liverpool, England, on June 26. While this is not the first ship to make the trip from that city across the Atlantic, it constitutes the first sailing of what is expected to be a regular trans-oceanic service. The Lake Gazette, the second of a fleet of 15, will be launched within 10 days in the yards of the Chicago Shipbuilding Co., and will carry the first trans-Atlantic cargo from Chicago to Hamburg.

The Lake Grandby is built of steel, is 261 ft. long with a 43½-ft. beam, and has a cargo capacity of 4100 tons. It has a speed of 12 knots and is equipped with a wireless outfit and submarine telephones. The rate from Chicago to Liverpool is \$1.25 from port to port.

Contracts of the Austin Co., Cleveland

The Austin Co., industrial engineer and builder, Cleveland, has recently been awarded the following contracts: Cuyahoga Spring Co., two-story factory, 80 x 146 ft., at Berea Road, near Detroit, to be used for making coiled wire springs; for the Bourne-Fuller Co., Cleveland, warehouse, 136 x 330 ft., to cost \$146,000; for the Homestead Valve Co., foundry building at Homestead, Pa.

Otis Steel Co. May Acquire Iron Properties

CLEVELAND, July 1—Negotiations are under way for the consolidation of the Otis Steel Co., Cleveland, with a leading Cleveland iron ore and blast furnace interest. Control of the Otis plant was recently acquired by William Salomon & Co., New York, bankers, by the purchase of the stock of English owners. It is officially announced, however, that the negotiations have not yet progressed sufficiently to insure the consummation of the deal.

The Donner Steel Co., Inc., Abbott Road, Buffalo, has arranged for stock issue of \$250,000, in connection with its proposed expansion plans. These plans include improvements and betterments at the works aggregating \$1,250,000 during the next 36 months, with purchase of additional property for new buildings. The company specializes in the production of basic, foundry and malleable iron, standard steel products, small structural shapes, spring steel, bar specialties and other products.

Plans for a series of improvements and betterments at its Wayne Junction plant have been prepared by the Midvale Steel & Ordnance Co., Widener Building, Philadelphia.

PITTSBURGH BASE PRICE

Controversy Carried to Washington—Hearing by Federal Trade Commission

Contending that the Pittsburgh, plus freight, base price has driven away industries that would otherwise have located in Minnesota, the Superior Commercial Club of Duluth, Minn., has issued a protest against that method of making quotations, and filed it with the Federal Trade Commission. The club asks that an injunction be granted against collecting the Pittsburgh base price, claiming that manufacturers in the head of the lakes region have thus been given an insurmountable handicap.

As the result of correspondence between the Western Association of Rolled Steel Consumers and Judge Gary, it has been agreed that the latter, in company with John S. Miller, counsel for the association, will appear before the chairman of the Federal Trade Commission and ask for a hearing on the proposed establishment of a Chicago base for rolled steel.

The association was formed in Chicago on Jan. 24 with a charter membership of 40 and has since enrolled over 800 members. The organization owes its existence to the dissatisfaction of Western rolled steel consumers with the Pittsburgh base.

Safety Work in Cleveland

The recent activities of the Northeastern Ohio Division of the National Safety Council, headquarters in Cleveland, included during the week of June 23 three large safety rallies for superintendents, foremen and supervisors, held in different sections of industrial Cleveland. The purpose of these meetings was to give impetus to safety work in the industrial plants, and the same program, which included songs, band, moving pictures, and a live man-to-man talk, "The Foreman at the Bat—A Home Run for Safety First," was given at each meeting.

A luncheon meeting for industrial plant executives was held at Hotel Statler on June 27, at which C. B. Auel of the Westinghouse Electric & Mfg. Co., Pittsburgh, discussed some of the important industrial relation problems and their relation to safety first activities.

At a banquet in Hotel Statler on July 7 the council will graduate a class of 120 safety supervisors who have been meeting weekly since March, taking up one of the important phases of safety work at each meeting. A diploma will be awarded each man. C. W. Price, general manager of the National Safety Council, and Charles B. Woodward, president of the Industrial Association of Cleveland, will address the graduates.

Attention is now being focused on the eighth annual congress of the National Safety Council, together with a safety week to be held in Cleveland beginning the first week in October.

A wage savings plan is announced at the Remy electric division of the General Motors Corporation. The employees will be permitted to deposit 10 per cent of their earnings with the corporation at 6 per cent interest. After five years the employees may duplicate the deposit dollar for dollar by investment in stock of the corporation or by cash withdrawals subject to prescribed terms.

A large valve foundry in Troy, N. Y., which had been paying its workmen \$5.40 daily for 9 hours' work, made the novel agreement with the employees to raise their pay to \$6.00 and shorten the day to 8 hours, effective July 1, the latter rates to hold provided the men prove that they produce as much as under the old scheme.

To provide for the purchase of the Griffin Wheel Co., Chicago, the American Steel Foundries has arranged for a preferred stock issue of \$9,000,000. The company is now operating nine plants, and is the largest producer of steel castings in the country.

Prices Finished Iron and Steel, f.o.b. Pittsburgh

The prices below are based on those announced at Washington by the Industrial Board on March 20, 1919, effective the following day, which since that date have largely governed market transactions, though there have been variations, as indicated in market reports on other pages.

Freight rates from Pittsburgh on finished iron and steel products, including wrought iron and steel pipe, with revisions effective Nov. 1, 1918, in carloads, to points named, per 100 lb., are as follows: New York, 27c.; Philadelphia, 24.5c.; Boston, 30c.; Buffalo, 17c.; Cleveland, 17c.; Cincinnati, 23c.; Indianapolis, 25c.; Chicago, 27c.; St. Louis, 34c.; Kansas City, 59c.; St. Paul, 49½c.; Denver, 99c.; Omaha, 59c.; minimum carload, 36,000 lb. to four last named points; New Orleans, 98.5c.; Birmingham, 57.5c.; Pacific Coast, \$1.25; minimum carload, 80,000 lb. To the Pacific Coast the rate on steel bars and structural steel is \$1.315, minimum carload 40,000 lb.; and \$1.25, minimum carload 50,000 lb. On wrought iron and steel pipe the rate from Pittsburgh to Kansas City is 50c. per 100 lb., minimum carload 46,000 lb.; to Omaha, 50c., minimum carload 46,000 lb.; to St. Paul and Minneapolis, 49.5c.; minimum carload 46,000 lb.; Denver, 99c.; minimum carload 46,000 lb. A 3 per cent transportation tax applies. On iron and steel items not noted above, rates vary somewhat and are given in detail in the regular railroad tariffs:

Structural Material

I-beams, 3 to 15 in.; channels, 3 to 15 in. angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zeels, structural sizes, 2.45c.

Wire Products

Wire nails, \$3.25 base per keg; galvanized, 1 in. and longer, including large-head barbed roofing nails, taking an advance over this price of \$1.50, and shorter than 1 in., \$2.00. Bright basic wire, \$3.15 per 100 lb.; annealed fence wire, Nos. 6 to 9, \$3.00; galvanized wire, \$3.70; galvanized barbed wire and fence staples, \$4.10; painted barbed wire, \$3.40; polished fence staples, \$3.40; cement-coated nails, \$2.85 base; these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven-wire fencing are 60½ per cent off list for carload lots, 59½ per cent for 1000-rod lots, and 58½ per cent off for small lots, f.o.b. Pittsburgh.

Bolts, Nuts and Rivets

Large structural and ship rivets, \$3.70 base
Large boiler rivets, \$3.80
¼ in., 5/16 in. and 7/16 in. diam., .65-10 and 5 per cent off list
Machine bolts, h.p. nuts, ¾ in. x 4 in.:
Smaller and shorter, rolled threads, .60-10-5 per cent off list
Cut threads, .60-5 per cent off list
Larger and longer sizes, .50-10 per cent off list
Machine bolts, c.p.c. and t. nuts, ¾ in. x 4 in.:
Smaller and shorter, .45-10-10 per cent off list
Larger and longer, .40-10-5 per cent off list
Carriage bolts, ¾ x 6 in.:
Smaller and shorter, rolled threads, .60-5 per cent off list
Cut threads, .50-10-5 per cent off list
Larger and longer sizes, .45-10 per cent off list
Lag bolts, .65-5 per cent off list
Plow bolts, Nos. 1, 2, 3, .60 per cent off list
Hot pressed nuts, sq. blank, .325c. per lb. off list
Hot pressed nuts, hex. blank, .325c. per lb. off list
Hot pressed nuts, sq. tapped, .3c. per lb. off list
Hot pressed nuts, hex., tapped, .3c. per lb. off list
C.p.c. and t. sq. and hex. nuts, blank, .325c. per lb. off list
C.p.c. and t. sq. and hex. nuts, tapped, .3c. per lb. off list
Semi-finished hex. nuts:
¾ in. and larger, .70-10 per cent off list
9/16 in. and smaller, .80 per cent off list
Stove bolts in packages, .75-10-10-5 per cent off list
Stove bolts, in bulk, .2½ per cent extra
Tire bolts, .60-10-10-5 per cent off list
The above discounts are from March 28, 1919.
All prices carry standard extras. Pittsburgh basis.

Wire Rods

No. 5 common basic or Bessemer rods to domestic consumers, \$52; chain rods, \$60; screw, rivet and bolt rods and other rods of that character, \$60. Prices on high carbon rods are irregular. They range from \$65 to \$75, depending on carbons.

Railroad Spikes and Track Bolts

Railroad spikes 9/16 in. x 4½ in. and heavier, and small spikes, per 100 lb., \$3.35 in lots of 200 kegs of 200 lb. each or more; track bolts, \$4.35 per 100 lb. in carload lots of 200 kegs or more, and \$4.90 in small lots. Boat and barge spikes, \$3.85 per 100 lb. in carload lots of 200 kegs or more, f.o.b. Pittsburgh.

Terne Plate

Prices of terne plate are as follows: 8-lb. coating, 200 lb., \$13.80 per package; 8-lb. coating, I. C., \$14.10; 12-lb. coating, I. C., \$15.80; 15-lb. coating, I. C., \$16.80; 20-lb. coating, I. C., \$18.05; 25-lb. coating, I. C., \$19.30; 30-lb. coating, I. C., \$20.30; 35-lb. coating, I. C., \$21.30; 40-lb. coating, I. C., \$22.30 per package, all f.o.b. Pittsburgh, freight added to point of delivery.

Iron and Steel Bars

Steel bars at 2.35c. from mill. Prices on bar iron are 2.35c.

Wrought Pipe

The following discounts are to jobbers for carload lots on the Pittsburgh basing card.

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
1½, ¾ and ¾	50½	24	1½ and ¾	29½	2½
1½	54½	40	¾	30½	3½
¾ to 3	57½	44	¾ to 1½	34½	16½
				39	23½
Butt Weld			Lap Weld		
2	50½	38	1½	24½	9½
2½ to 6	53½	41	1½	31½	17½
7 to 12	50½	37	2	32½	18½
13 and 14	41	..	2½ to 6	34½	21½
15	38½	..	7 to 12	31½	18½
Butt Weld, extre strong, plain ends			Lap Weld, extra strong, plain ends		
1½, ¾ and ¾	46½	29	1½, ¾ and ¾	28½	11½
1½	51½	39	¾	33½	20½
¾ to 1½	55½	43	¾ to 1½	39½	24½
2 to 3	56½	44			
2	48½	37	1½	25½	10½
2½ to 4	51½	40	1½	31½	17½
4½ to 6	50½	39	2	33½	20½
7 to 8	46½	33	2½ to 4	35½	23½
9 to 12	41½	28	4½ to 6	34½	22½
			7 to 8	26½	14½
			9 to 12	21½	9½

To the large jobbing trade an additional 5 per cent is allowed over the above discounts, which are subject to the usual variations in weight of 5 per cent.

On butt and lap weld sizes of black iron pipe, discounts for less than carload lots to jobbers have been seven (7) points lower (higher price) than carload lots, and on butt and lap weld galvanized iron pipe have been nine (9) points lower (higher price).

Boiler Tubes

The following are the prices for carload lots, f.o.b. Pittsburgh:

Lap Welded Steel	Charcoal Iron
3½ to 4½ in. 40½	3½ to 4½ in. —16
2½ to 3½ in. 30½	3 to 3½ in. —1½
2½ in. 24	2½ to 2¾ in. +1
1¾ to 2 in. 19½	2 to 2½ in. +10
	1¾ to 1½ in. +20

Standard Commercial Seamless—Cold Drawn or Hot Rolled

Per Net Ton	Per Net Ton
1 in. \$327	1½ in. \$207
1½ in. 267	2 to 2½ in. 177
1¾ in. 257	2½ to 3 in. 167
1½ in. 207	4 in. 187
	4½ to 5 in. 207

These prices do not apply to special specifications for locomotive tubes nor to special specifications for tubes for the Navy Department, which will be subject to special negotiation.

Sheets

Makers' price for mill shipments on sheets of United States standard gage in carload and larger lots are as follows:

Blue Annealed—Bessemer	Cents per lb.
No. 8 and heavier	3.50
Nos. 9 and 10 (base)	3.55
Nos. 11 and 12	3.60
Nos. 13 and 14	3.65
Nos. 15 and 16	3.75

Box Annealed, Ore Pass Cold Rolled—Bessemer	
Nos. 17 to 21	4.15
Nos. 22 to 24	4.20
Nos. 25 and 26	4.25
No. 27	4.30
No. 28 (base)	4.35
No. 29	4.45
No. 30	4.55

Galvanized, Black Sheet Gage—Bessemer	
Nos. 10 and 11	4.70
Nos. 12 and 14	4.80
Nos. 15 and 16	4.95
Nos. 17 to 21	5.10
Nos. 22 to 24	5.25
Nos. 25 and 26	5.40
No. 27	5.55
No. 28 (base)	5.70
No. 29	5.95
No. 30	6.20

Tin-Mill Black Plate—Bessemer	
Nos. 15 and 16	4.15
Nos. 17 to 21	4.20
Nos. 22 to 24	4.25
Nos. 25 to 27	4.30
No. 28 (base)	4.35
No. 29	4.40
No. 30	4.40
Nos. 30½ and 31	4.45

Non-Ferrous Metals

The Week's Prices

Cents per Pound for Early Delivery								
Copper, New York			Lead			Zinc		
	Lake	Electro-lytic	Tin, New York	New York	St. Louis	New York	St. Louis	
June								
25	18.62½	18.37½	70.00	5.40	5.15	7.35	7.00	
26	18.75	18.50	70.00	5.40	5.15	7.40	7.05	
27	18.87½	18.62½	70.50	5.40	5.15	7.40	7.05	
28	19.00	18.75	....	5.40	5.15	7.40	7.05	
30	19.12½	18.87½	70.50	5.40	5.15	7.40	7.05	
July								
1	19.25	19.00	70.50	5.40	5.15	7.45	7.10	

NEW YORK, July 1.

With the turn of the half year and because of the approaching holidays, all the markets are quiet. Prices are firm and in some cases advancing. Copper continues to sell higher. The tin market is very quiet despite the removal of many restrictions. Lead is very quiet but strong. Demand for zinc (spelter) is less, but prices are strong. Antimony is unchanged.

New York

Copper.—A moderate business has been done in the past week and prices have advanced almost daily. Electrolytic copper for July delivery is quoted and sold to-day at 19c. to 19.25c., New York, with August at least ¼c. higher. Some reports are that July copper is difficult to obtain at less than 19.25c., New York. While there are inquiries for delivery beyond August and as far ahead as the first quarter of next year, producers generally are only interested in selling up to September, being confident of a rising market. Lake copper is strong and firm at ¼c. to ½c. above electrolytic, or 19.25 to 19.75c., New York, for July. The general market has a strong and confident tone and 20c. copper is freely predicted. Japan continues a buyer.

Copper Averages.—The average price of Lake copper in June, based on daily quotations in THE IRON AGE, was 17.95c. The average price of electrolytic was 17.70c.

Tin.—The market has been quiet the past week, but a little business has been done here and there. The total for the week has, however, been small and disappointing. There has been some scouting around for stock Straits tin by consumers unsupplied, and some of this has been sold at 70c. to 70.50c. spot, New York, which we quote as the market. Dealings, however, are narrow and restricted and will be so naturally until normal supplies are in evidence. Import licenses are being granted for future shipment of Straits and English tin at about 50.75c. and 50.25c. respectively. On Straits tin for shipment from England, when permissible, 51.50c. is quoted. These facts indicate that in August there will be on the market in the United States English tin as well as American, which is now selling at about 68c., New York.

Lead.—The lead market is quiet but very firm at 5.40c., New York, or 5.15c., St. Louis, the price of the leading interest. There is talk of premiums at 5.45c., New York, in the outside market, but it is probably only for limited amounts. The reported fact that the leading producer is not selling at present is interpreted to mean that an advance will soon be announced.

Zinc (Spelter).—This market is also quiet, but the tone is firm with the price tendency upward. Prime Western for July delivery is quoted at 7.10c., St. Louis, or 7.45c., New York, with August and September five points above this level respectively. Prices have slowly advanced in the week, though buying has not been in large volume. Producers are much in the same position as the copper producers—not anxious to sell futures and comfortably situated as to nearby positions. Japan continues in the market.

Antimony.—There is no material change. Demand is light and prices are nominal at 8.37½c. to 8.50c., New York, duty paid.

Aluminum.—No. 1 virgin metal, 98 to 99 per cent pure, is unchanged at 33c., New York, for wholesale lots for early delivery.

Old Metals.—The market is firm. Dealers' selling prices are nominally as follows:

	Cents per lb.
Copper, heavy and crucible	18.00
Copper, heavy and wire	17.00
Copper, light and bottoms	15.00
Brass, heavy	12.50
Brass, light	9.00
Heavy machine composition	17.25
No. 1 yellow rod brass turnings	9.50
No. 1 red brass or composition turnings	14.00
Lead, heavy	5.00
Lead, tea	4.25
Zinc	5.00

St. Louis

ST. LOUIS, June 30.—The lead and spelter markets have been firm during the week with the closing quotations, car lots: Lead, 5.15c; spelter, 7c. In less than car lots the prices were: Lead, 5.50c to 5.75c; spelter, 7.50c; tin, 72.50c; copper, 18.50c; Asiatic antimony, 9.50c. In the Joplin district ore has continued to show a better tone and there has been a better range of prices, with not so wide a spread as in the past. On miscellaneous scrap metals we quote as follows dealers' buying prices: Light brass, 7c; heavy yellow brass, 9c; heavy red brass, 13.50c; heavy copper and copper wire, 13.50c; light copper, 11c; pewter, 35c; tinfoil, 44c; zinc, 3.50c; lead, 4c; tea lead, 3c; aluminum, 18c.

Chicago

CHICAGO, July 1.—Copper, lead and spelter have advanced. There has been a fairly good volume of business in lead and copper, but spelter has been quiet and has risen in sympathy with copper rather than because of an increase in demand. The regulations governing the purchase of tin have been partially removed. There is considerable trading in tin at from 70c. to 72.50c. Antimony continues quiet but firm. Old copper and brass have advanced again. We quote copper at 19c. to 19.50c. for carloads; tin, 70c. to 72.50c.; lead, 5.25c. to 5.35c.; spelter, 7.10c. to 7.25c.; antimony, 9.50c. to 10c. On old metals we quote copper wire, crucible shapes, 15.25c.; copper clips, 14.75c.; copper bottoms, 13.50c.; red brass, 15.25c.; yellow brass, 10c.; lead pipe, 4c.; zinc, 4c.; pewter, No. 1, 35c.; tinfoil, 37c., and block tin, 50c., all these being buying prices for less than carload lots.

Only Slight Changes in New Sheet and Tin Plate Scales

On Wednesday, June 25, a settlement was reached at Atlantic City, N. J., on the sheet and tin plate scales for the new scale year, beginning July 1, by wage committees of the Amalgamated Association of Iron, Steel and Tin Workers and a committee from the sheet and tin plate mills that sign the amalgamated scales. The Amalgamated Association had made some extreme demands for advances in wages, and working conditions in sheet and tin plate mills, but these were all practically withdrawn at the conference. Among the demands made was for a 25 per cent advance in the base rates, also a 6-hr. day in sheet and tin plate mills, which would have meant four turns instead of three, which has been the custom for many years, and sliding scales for sheet and tin plate mills, practically based on present prices of these products. The sheet and tin plate manufacturers refused to grant any of these demands, but did finally agree to some readjustments in the old sheet and tin plate scales by which an advance in the total of sheet mill wages of 3.6 per cent is given the men, and an advance of 2.6 per cent is given the men in the tin plate mills. These advances are made up as follows:

Sheet scale: Heater's helper, 6 per cent; pair heaters, matchers and doublers, 10 per cent advance.
Tin scale: Heaters' helpers, 8 per cent; doubler's helper, catchers and screw boy, 10 per cent advance; doublers on 27 and 28 gage doubled twice to receive \$1.39.

PERSONAL

Charles D. Oesterlein, Jr., vice-president Oesterlein Machine Co., Cincinnati, sailed from New York July 2 for a four months' business trip to Europe. He expects to visit England, France and Belgium and probably the Scandinavian countries.

Charles H. Norton, chief engineer the Norton Co., Worcester, Mass., was one of the speakers last week at the fiftieth anniversary celebration of Plainville, Conn., where he was born.

R. Sanford Riley of the Sanford-Riley Stoker Co., Worcester, Mass., sailed on the Aquitania from New York, Monday, for a two months' European trip on business of the company.

J. J. O'Brien, in charge of the publicity department Lodge & Shipley Machine Tool Co., Cincinnati, has resigned to accept a position as salesman for the Colcord-Wright Machinery & Supply Co., St. Louis. He assumed his duties July 1.

Lieut. John Rothier of the sales department of Walter Wallingford & Co., Cincinnati, has returned to work after a year's service in France.

L. S. Devos, recently with the American Expeditionary Forces, has been placed in charge of the New York office at 24 Stone Street to handle export business for the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

Georges Somme, who represents Leflaive & Co., St. Etienne (Loire), France, has returned to the United States for a short stay. He is located at the McAlpin Hotel, New York. Leflaive & Co. make forging and mining machinery, heavy machine tools, steam engines and steam turbines, boilers, gas engines and gas producers, electric cranes, pressure pipe lines, valves, etc.

James A. Farrell, president United States Steel Corporation, with a number of iron and steel officials, recently inspected the Fayette County properties of the H. C. Frick Coke Co. After inspecting the river properties of the company the party proceeded to Pittsburgh. Among others with Mr. Farrell was H. D. Williams, president Carnegie Steel Co.

John F. Wade succeeds F. W. Nettleton, who has resigned as superintendent of the Bristol Brass Co., Bristol, Conn. Mr. Wade was formerly works manager of the plant and has also been mayor of the city. A. B. Seelig, vice-president and general manager, has also resigned.

At the June 24 meeting of the Crucible Steel Co. of America three new directors were elected: W. H. Childs, president the Barrett Co.; August Heckscher, president New Jersey Zinc Co., and Judge Nathan L. Miller, New York.

Jose M. Garmendia, who for the past two years has been with the iron, steel and machinery departments of the Federal Export Corporation, sailed Saturday, June 28, for Buenos Aires, Argentina, where he will take charge of these particular departments of the Federal Export Corporation in the Republic of Argentina, under the direction of the general manager, George V. Guyer. Mr. Garmendia comes from one of the well-known steel families in Spain, where he obtained his early experience in the manufacture of steel.

Asher Golden, 311 West Fifty-ninth Street, New York, has been appointed United States agent for Compagnie d'Applications Mécaniques, Paris, manufacturer of bearings.

F. R. Mead, captain Ordnance Department, formerly head gage section, inspection division, and who recently received his discharge, has accepted a position as eastern representative, Wilton Tool & Mfg. Co., Boston.

Ernest Perrin, representing the industrial fair of Lyons, France, has opened an office at 3 Park Row, New York, from which he will handle matters relating

to the exhibition of American hardware and machinery at the autumn fair to be held Oct. 1 to 15. It is stated that exhibits cannot be accepted after July 31.

The American Metallurgical Corporation which controls and operates the Philadelphia Electric Steel Corporation, Conshohocken, Pa., announces that John Gillespie has superseded Arthur S. Breithaupt as general superintendent of the steel plant, Mr. Breithaupt being no longer in the corporation's employ. Mr. Gillespie has been with the steel casting department of the Midvale Steel Co. for 24 years. Additional electric furnace units will be added.

George R. Carr, vice-president Dearborn Chemical Co., Chicago, was elected president of the Railway Supply Manufacturers' Association, at the annual meeting of the association held June 21 at Atlantic City.

Gov. William N. Runyon, of New Jersey, has appointed as personal aide and member of his military staff Col. Paul Debevoise, of the Debevoise-Anderson Co., New York. Colonel Debevoise made a distinguished record in France as a major of a battalion of the 312th Infantry of the 78th Division.

George Ellery Hale, director of the Mount Wilson Observatory and foreign secretary of the National Academy of Sciences, who has been for the last 10 years a correspondent of the Académie des Sciences, Institut de France, has received the unusual honor of election as *associé étranger*, taking the place of Adolph von Baeyer, declared vacant by the academy. The foreign associates are limited to 12, and the high distinction has been held by only two Americans, Simon Newcomb and Alexander Agassiz. The National Research Council, upon the presentation and acceptance of Dr. Hale's resignation as its chairman and the election of James R. Angell as his successor, created and bestowed in perpetuity upon Dr. Hale the title of honorary chairman in recognition of his services to the National Research Council and to science and research by indefatigable efforts that have contributed so largely to the organization of science for the assistance of the Government during the war, and the augmentation of the resources of the United States through the newly intensive cultivation of research in the reconstruction and peace periods that follow.

B. G. Tremaine has been elected president of the Peerless Truck & Motor Corporation, Cleveland, succeeding Harrison Williams, New York, who has resigned as president and as member of the executive committee, but will remain on the board of directors. F. S. Terry has been elected vice-president and chairman of the executive committee, T. W. Frech treasurer, and G. B. Siddall secretary. The reorganization followed the restoration of control of the company from New York to Cleveland interests.

G. A. Trube, former export manager Westinghouse Air Brake Co., Pittsburgh, has joined Gaston, Williams & Wigmore, New York.

P. A. Widing assumed his duties July 1 as employment manager of the Brier Hill Steel Co., Youngstown, Ohio. This is a newly created office, the work heretofore having been handled through the safety department. Mr. Widing was assistant employment superintendent of the Youngstown Sheet & Tube Co. C. M. Ott, in charge of the work of placing soldiers through the Youngstown Chamber of Commerce, will aid in the duties formerly performed by Mr. Widing.

H. R. Trotter has been appointed chief engineer of the S K F Industries, Inc., New York, having formerly been chief engineer of the S K F Ball Bearing Co.

W. C. Tyler, New York district manager the Poole Engineering & Machine Co., Baltimore, has been appointed general sales manager, the office having been moved from Baltimore to New York.

Employees of Section K, Switchboard Division, of the Westinghouse Electric & Mfg. Co., tendered a farewell dinner last week in the Hotel Henry, Pittsburgh, to J. A. Bickman, assistant superintendent for the last seven years. He will go to Holland to join his brother in business. W. D. Dittmer, the toastmaster, on behalf

of the guests, presented Mr. Blickman a gold watch and chain. Mr. Blickman has been an employee of the company for 15 years. The guest of honor made a speech in which he expressed his gratitude to the company, and the employees of the section.

Lieut. Earle W. Vinnedge, formerly of the Seventh Engineers' Train, has been appointed sales engineer with the Worthington Pump & Machinery Corporation, Cincinnati.

Ernest Gledhill has been appointed engineer representing the equipment division, salvage sales section, Remington Arms UMC. Co., Bridgeport, Conn.

Albert Brunt, for four years in the industrial engineering department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, as engineer in charge of direct-current machine design, has resigned, and will return to Holland.

Cleveland C. Soper, former instructor of machine design, Wentworth Institute, Boston, has become engineer with the Kent Machine Co., Kent, Ohio.

Capt. Sidney R. McCurdy, chief surgeon of the Youngstown Sheet & Tube Co., Youngstown, Ohio, who served on the west front in France with Base Hospital No. 31, has been awarded the Croix de Guerre with bronze star by the French Government. A letter from Field Marshal Petain announced the award and citation. The order reads that Capt. McCurdy was "unusually self-sacrificing, worked without thought of self in the performance of his duties, and on the field of battle, under violent bombardment, obtained appreciable results, especially in the Argonne."

F. W. Shumard, supervisor of the machine and small tools branch of the Motor Transport Corps, Maintenance Division, Washington, D. C., has become superintendent of Arnold Hellmuth Mfg. Co., Brooklyn, N. Y.

L. C. Murray, for several years with the Carnegie Steel Co., Pittsburgh, has been appointed sales engineer of the Blaw-Knox Co., Pittsburgh, work at Hoboken, Pa.

L. H. Elliott has been elected vice-president and secretary of the Upson Nut Co., Cleveland, to fill the vacancy caused by the resignation of Norris J. Clarke, and will retain his former position as secretary and treasurer of the Bourne-Fuller Co., Cleveland, dividing his time between the two companies.

Judge Gary Entertains

Judge Elbert H. Gary gave a dinner in honor of Dr. Epitacio Pessoa, president-elect of Brazil, at the Metropolitan Club, Fifth Avenue and Sixtieth Street, New York, Tuesday, July 1. Eighty guests were present, including prominent steel manufacturers. There were no speeches.

Will Build Open Hearth Furnace and Bar Mill

CHICAGO, July 2.—The Interstate Iron & Steel Co. will install a new 75-ton open-hearth furnace and will erect a continuous bar mill at South Chicago. In addition, it plans to rearrange its tracks and improve its facilities for handling scrap in its yards. The addition of the furnace will make a total of five at the South Chicago works.

Counselman & Co., Chicago, have purchased and will offer \$1,400,000 worth of 7 per cent preferred stock of the company and in conjunction with A. G. Becker & Co., are forming a distributing syndicate.

Will Build Furnace

The Hamilton Furnace Co., Hamilton, Ohio, has purchased a large tract of land adjoining its present plant. It is reported that the company will build a stack that will double its present output of pig iron. John A. Savage, Duluth, Minn., president of the company, when asked by telegraph whether the report was well founded, replied, "Yes, but we don't know when."

OBITUARY

Brief mention was made on page 1745 of THE IRON AGE of June 26 of the death of William A. Bole, a well-known mechanical engineer, who died at his home



WM. A. BOLE

in the East End, Pittsburgh, on Monday, June 16. Mr. Bole, who at the time of his death was holding the position of assistant to the vice-president of the Westinghouse Electric & Mfg. Co., East Pittsburgh, was born in 1861, and graduated from the Allegheny, Pa., high school when he was but 16 years of age. His early ambition was to enter the army, he having developed a strong preference for military life, and he passed all the examinations necessary for admission to West Point, but was rejected because of physical imperfections. He took the apprenticeship course at the Westinghouse plants and had been in the employ of that company for 38 years. He was a member of the American Society of Mechanical Engineers, a past president of the Engineers' Society of Western Pennsylvania, a member of the Duquesne Club, the American Foundrymen's Association and the Shady-side Presbyterian Church. He leaves his wife and one daughter.

EDWARD A. CASWELL of the firm of Caswell & Starke, Inc., New York, one of the most prominent metal brokers of New York, died suddenly June 25 at the home of his son in West Chester, Pa. He was in his 75th year, having been born in New York City, Nov. 27, 1844. He was graduated from Yale University in 1866, but before entering active business life he spent six years in study and travel in Europe. Not until 1873 did he commence business as a metal broker in New York, when he revived the metal brokerage business founded by his father, Nathan Caswell, in John Street. In those early years he became prominent in the lead and zinc trade. At that time he was an authority, recognized by the Government, as a statistician. Soon after the formation of the American Smelting & Refining Co., because of the important changes resulting therefrom, Mr. Caswell enlarged his business so as to take in copper, tin and other metals, and he became the agent of A. Strauss & Co., a tin firm of London. Due to his advancing years, Mr. Caswell in December, 1912, incorporated his business under the name of Caswell & Starke, Inc., and this has continued up to the present time. In the pig-tin trade he became influential and his firm has been one of the largest factors in this important metal in the past few years. For some years Mr. Caswell has taken very little interest in the actual business of his firm, but, due to the prominence and signal integrity of the senior member, the firm has continued in the confidence of the trade under the direction of Edward W. Starke. In the 45 years of his career as a New York metal broker Mr. Caswell was recognized first of all for his high sense of honor and business probity, as well as a man of unusual culture. He was a member of several of the Yale clubs and fraternities, and a matter of considerable pride to him was the inauguration by him of inter-collegiate contests in chess which, with the exception of the period of the war, have taken place ever since between Yale, Harvard, Princeton and Columbia. The non-ferrous trade suffers a distinct loss in the passing of Mr. Caswell.

WILSON R. KERSCHNER, president W. R. Kerschner Co. and vice-president Columbia Works and Malleable

Iron Co., Brooklyn, N. Y., died of pleural pneumonia June 21 in New York at the age of 47. He had been in his present position since 1910. He was born March 12, 1872, and lived the greater part of his life in Allentown, Pa. He represented the following companies: Cincinnati Car Co., Cincinnati; National Safety Car & Equipment Co., St. Louis; Keyes Products Co. of Connecticut; Albany Car Wheel Co.; Charles I. Earll, maker of trolley catches and retrievers, York, Pa.

CHRISTOPHER AHRENS, president the Ahrens-Fox Fire Engine Co., Cincinnati, died at his residence in that city June 26, aged 84 years. He was a native of Germany and came to this country when 15 years old. He was first employed by the former Lane & Bodley Co., engine builder, and later established the Ahrens Mfg. Co., making a specialty of building fire engines. He retired from business in 1895 and was succeeded in the management of the firm, of which he was president, by Charles H. Fox, his son-in-law.

IRA B. BASSETT, for many years identified with the iron and steel industry in Cleveland, as president of the Bassett-Presley Co., jobbers, died in Hyannis, Mass., June 29, aged 71 years. The Bassett-Presley Co. sold its warehouse in 1912 to the Carnegie Steel Co. and discontinued business. Mr. Bassett retired shortly afterward and has been living in Massachusetts for several years. Mr. Bassett for a number of years had been one of the trustees of the Peter Kimberly estate. He was born in Hyannis, in 1848.

No Settlement of Bar Iron Scale Reached

No settlement of the puddling and finishing scales for bar iron mills that signed the Amalgamated Association's scale had been reached, up to the time THE IRON AGE went to press. Committees representing that association and the bar iron mills have been in session at Atlantic City, N. J., in an effort to fix the bar iron scale for the year commencing July 1. The case presented by the Amalgamated Association is based on bar iron at 1.30c. The rate asked for puddling at this price is \$5.82½, an advance of 5 per cent over the scale which expired on June 30, when bar iron reached 1.80c. The advance in boiling asked is 10 per cent. This is the principal contention between the bar iron manufacturers and the Amalgamated Association, the manufacturers contending that the men are not entitled to any advance this year. It is stated a settlement of the scale is likely to be reached this week.

The Brass Workers' Strike

The strike of brass workers at Waterbury, Conn., and other cities in the Naugatuck Valley has been generally settled on the basis of an advance of 10c. per hr. dating from June 22 to all employees working on an hourly basis, while piece workers get a proportionate advance. All time over 8 hr. daily is to be paid rate and one-half. About 700 of the 5000 who had quit work at Waterbury returned Tuesday of last week and others quickly followed.

At a meeting of machinists, attended by 600 skilled men, it was voted not to strike.

It was erroneously reported last week that the strike extended to Bridgeport. There has, in fact, been no trouble in Bridgeport since the National War Labor Board settled the strike in that city some months ago.

Labor and Scientific Research

The American Federation of Labor adopted a resolution at its Atlantic City convention declaring that a broad program of scientific and technical research is of major importance to the national welfare and should be fostered in every way by the Federal Government, and that the activities of the Government itself in such research should be adequately and generously supported in order that the work may be greatly strengthened and extended.

OFFICE CHANGES

The Midwest Engine Co., Indianapolis, manufacturer of pumping equipment, etc., has opened four new offices as follows: Florida Life Building, Jacksonville, Fla., in charge of D. J. Carrison, formerly with the Busch-Sulzer Bros. Diesel Engine Co., St. Louis, and later with D. J. Carrison & Co., manufacturers' agency for shipyards; 303 Caples Building, El Paso, Tex., in charge of Chester B. Loomis, formerly consulting engineers and later major of engineers, Purchase, Storage and Traffic Division, General Staff of the Army; 111 Broadway, New York, in charge of B. H. Downing, for seven years engaged in the marketing of pumps, condensers, etc.; 617 Maison Blanche Building, New Orleans, in charge of J. R. Lowe, who has had previous experience in marketing prime movers and pumps.

Wonham, Bates & Goode, Inc., engineers, manufacturers' representatives and exporters, 17 Battery Place, New York, have opened a branch in Montreal at 305 Dominion Express Bldg., in charge of A. G. Nutter, who was formerly with Mussels, Ltd. This extension is for the purpose of facilitating business between the United States and Canada, particularly in railway supplies, industrial equipment and iron and steel products.

The Chicago Pneumatic Tool Co. is removing its Cincinnati offices from the Mercantile Library Building to the Walsh Building, Third and Vine Streets. The new quarters of the company will have 3500 sq. ft. of floor space, a large part of which will be used for storage purposes. T. G. Smallwood is district manager.

The Niles-Bement-Pond Co., 111 Broadway, New York, manufacturer of machine tools, has leased space in the Stevenson & Foster Building, 425-27 Seventh Avenue, Pittsburgh, for its local business.

The Pittsburgh office of the Stewart Iron Co., Ltd., Cleveland, is now located in 1515 Farmer's Bank Building. Clyde Brooks is Pittsburgh district sales manager of the company.

Frank D. Moffat & Co., pig iron, coke, steel castings, forgings, with offices at 81 Fulton Street, New York, for nearly 29 years, have moved their office to 200 Fifth Avenue.

The Norton Co., Worcester, Mass., manufacturer of alundum and crystolon grinding wheels and other abrasive products, announces the opening of a store in Detroit at 73-75 West Congress Street.

The Walter A. Zelnicker Supply Co., St. Louis, has added 2000 sq. ft. to its present office space at 325 Locust Street, St. Louis, an increase of 33 1/3 per cent.

Camden Forge Co., Camden, N. J., has established a New York office on the 17th floor of 2 Rector Street in charge of Samuel W. Hilt.

The Eagle Pipe Supply Co., Inc., 30 Church Street, New York, has moved to the Woolworth Building.

The Atlantic Equipment Co., New York, has moved its offices to 30 Church Street of that city.

The Electric Hoist Manufacturers' Association has issued a booklet entitled, "Facts for Operators of Electric Hoists," prepared by the association's engineering committee, and which will be distributed gratis by the secretary, W. C. Briggs, 30 Church Street, New York. A new booklet on track, supports, current conductors, etc., will be issued soon.

Fire extinguishment is discussed in issue No. 24 of Safe Practices, issued by The National Safety Council, 168 North Michigan Avenue, Chicago.

WORLD IRON AND STEEL OUTPUT

Considerable Decline in 1918 in Both—United States More Than Twice All Others

The National Federation of Iron and Steel Manufacturers of Great Britain has issued a memorandum on the world's output of iron and steel, which contains a statistical survey for several years past. Below are given those figures which have not hitherto been published with those of previous years for purposes of comparison. The production of pig iron and steel in the leading countries was as follows:

Pig Iron Production			
	1918	1917	1916
United Kingdom...gross tons	9,066,000	9,420,000	9,048,000
United States...gross tons	39,052,000	38,621,000	39,435,000
Germany...metric tons	11,590,000	13,142,000	13,285,000
France...metric tons	1,297,000	1,684,000	1,447,000
Total	61,005,000	62,867,000	63,215,000
Steel Production			
	1918	1917	1916
United Kingdom...gross tons	9,591,000	9,804,000	9,196,000
United States...gross tons	45,073,000	45,061,000	42,774,000
Germany...metric tons	14,874,000	16,587,000	16,183,000
France...metric tons	1,912,000	2,232,000	1,952,000
Total	71,450,000	73,684,000	70,105,000

The German production for 1918 does not include the output of Luxemburg, the Saar District, and the disannexed Lorraine Province during November and December of that year. The British steel figures include steel castings.

The first and most significant feature of these tables, it is pointed out, is the fall during the war of the output of iron and steel in both France and Germany, the figures in both cases reaching the lowest level in 1918. The United States shows a great increase during the war, while in Great Britain the figures show a fairly constant output of pig iron and an increased output of steel.

In the case of pig iron the production of these four countries in 1900 amounted to 34,000,000 tons, of which Great Britain produced 9,000,000 tons. In 1913 the total output had risen to 66,000,000 tons, of which Great Britain produced 10,000,000 tons, while in 1918 the total had fallen to 61,000,000 tons, of which Great Britain produced 9,000,000 tons.

The production of iron and steel in countries of the second rank in 1916 and 1917 is given as follows:

	Pig iron		Steel	
	1917	1916	1917	1916
Austria-Hungary	2,418,000	2,921,000	3,330,000	
Canada	1,046,000	1,070,000	1,550,000	1,287,000
Italy	475,400	467,000	1,304,000	1,269,000
Russia		3,738,000		
Sweden	829,000	733,000	581,000	614,000
Belgium		127,825		95,830

These countries contributed at the outbreak of war about 9,000,000 tons of pig iron and 12,000,000 tons of steel to the world's production. The figures for Italy are significant of the extent to which that country has relied on scrap steel and imported pig iron to obtain steel output.

Belgian Machinery and Metal Position

A correspondent of the *London Iron Monger* in Belgium has recently sent the following regarding the metal and machinery condition at present and some of the prospects:

Belgian officials, like those of every other country, are slow to move, and very little has been done by them to get back the machinery which was stolen and taken to Germany. An influential manufacturer has said that, as he could not get any satisfaction through the government, his son has gone to Germany to try and recover some of his machinery. This gentleman was wise enough, when it was requisitioned, to make a note to what factory in Germany every piece of his machinery was assigned, and he now knows exactly where to find it.

These circumstances, of course, retard the absorption of metals by the plants of the country and, although a certain quantity of metal has been bought to stock

the country to a small extent in order to start working the machinery still there, it will be months before Belgian industries can take anything like their normal quantity of metals again. Telephones are a thing almost non-existent in every town. The impression in Brussels alone was that out of the tens of thousands of telephones which existed before the war there were hardly a hundred left, all the wires and apparatus having been removed by the Germans. This naturally makes business very difficult, but it will tend to absorb a large quantity of metal later on.

For another six months the world must not look to Belgium as a large consumer of raw materials. Later on, no doubt, the country will be requiring heavy supplies of metal.

The British Coke-Oven War Record

Facts and figures are now available showing the important part played by coke ovens and by-product plants in providing raw materials for the British Ministry of Munitions, says the *London Iron and Coal Trades Review*. In the early days of the war the Explosive Department of the Ministry of Munitions started an organization for the stimulation of by-products manufacture and the supervision and assistance of the coke oven and by-product plants from which benzol and toluol are obtained. The country was divided into districts as follows: Northern district comprising 29 firms; Yorkshire district comprising 44 firms; Western district comprising 20 firms; Welsh district comprising 9 firms.

Detailed figures are given in the return prepared by the Ministry showing the production of coke and by-products from coke-oven plants in the United Kingdom for the years 1917 and 1918. The totals are as follows:

Year	Coal carbonized, tons	Crude 65s benzol produced, gal.	Coke produced, tons	Tar produced, gal.
1917.....	15,275,267	33,552,791	10,866,673	107,079,162
1918.....	14,635,403	32,162,598	10,552,648	102,781,690

The explosives department, in conjunction with the steel production department, arranged for a large number of new ovens to be added to existing batteries, where the recovery plants could deal with further gas with little or no alteration, and in several instances entirely new ovens and recovery plants were built. Batteries in the course of completion were speeded up.

Owing to differences in the salt content of various coals, and to other reasons, the walls of some coke-oven plants deteriorated much more quickly than at other plants. In spite of this, all coke-oven companies wished to obtain, and considered that they were entitled to get, the best quality bricks. Unfortunately, the supply of these was strictly limited, and it was found essential that the source of supply should be controlled and the bricks strictly rationed.

The success of the policy of the department may be gathered from the figures of production of crude benzol recovered from coke ovens alone. They are as follows:

	Gal.
1913 (estimated)	18,920,000
1914	21,877,000
1915	25,148,000
1916	31,081,000
1917	33,552,000
1918	32,162,000

The falling-off in 1918 was due to the very serious shortage of coal, and the signing of the armistice.

The increase in the number of by-product ovens in operation is shown by the following figures:

On July 31—	
1914	5,893
1915	6,491
1916	7,719
1917	8,219
1918	8,412

When the armistice was signed, 1253 further ovens were in course of construction. When it is remembered that under the most favorable circumstances a battery of coke ovens and the necessary by-product plant can scarcely be constructed in under eighteen months to two years, it may be acknowledged that the record set out above is one calculated to afford considerable gratification.

DETAILS OF NORTON MERGER

Purchase of Plant in Japan Announced—Changes in Active Executive Offices

With the merger of the business of the Norton Grinding Co. into the Norton Co., Worcester, Mass., which was noted in THE IRON AGE last week, the name of the former company, associated all over the world with precision grinding machines, disappears completely. The business of the two companies was so closely associated, both in ownership and in the affiliated nature of their products, that centralization of effort was considered a natural consequence, especially in view of the rapid extension of the field of both industries in foreign countries as well as in the United States.

The Norton Co. has acquired a controlling interest in the Hiroshima Grinding Wheel Co., Hiroshima, near Kobe, Japan, the largest of its kind in that empire, a business which was established some years ago by the F. W. Horne Co., dealers in machinery and manufacturers' supplies. The plant will supply the Norton Co.'s trade in the Far East. It is also announced that the company has established sales agencies with native houses in foreign countries, including England, France, Belgium, Italy, Holland and Denmark, and similar connections will be made immediately in Sweden and Norway. All of these countries have been visited frequently during the past few years by W. LaCoste Neilson, of Leicester, England, one of the new vice-presidents and the foreign manager. The Norton Co., in its formal announcement of the change in policy in connection with the Norton Grinding Co. states:

In meeting this change and in planning for the larger success of the combined business of the two companies some reorganization has taken place in the active executive offices of the Norton Co. George I. Alden, who has been president of the Norton Co. since the death of

the late Milton P. Higgins, its first president, will be chairman of the board. Charles L. Allen becomes president and general manager; Aldus C. Higgins, treasurer and general counsel, and George N. Jeppson, secretary and works manager.

Two new offices of vice-president have been created, one to be filled by W. LaCoste Neilson, Leicester, England, vice-president and foreign manager, the other by Carl F. Dietz, vice-president and general sales manager.

The board of directors is not changed and consists of the following: George I. Alden, Aldus C. Higgins, John Jeppson, Charles L. Allen, George N. Jeppson and R. Sanford Riley.

Under Vice-president Carl F. Dietz, will be conducted the sales departments of both companies, Herbert Duckworth being sales manager of the grinding wheel department and Howard W. Dunbar, sales manager of the grinding machine department. C. O. Smith assumes the newly created position of consulting sales engineer to Mr. Dietz. Henry Duckworth is controller of the company, in full charge of the accounting.

Announcement was also made of the decision of Ross C. Purdy to leave the exclusive employ of the Norton Co. to become consulting engineer with headquarters in Buffalo. The Norton Co. has, however, secured Mr. Purdy's exclusive services in the abrasive and refractory fields, and he becomes consulting ceramic engineer for the Norton Co.

Lewis E. Saunders of Niagara Falls, N. Y., manager of abrasive plants, will shortly move with his family to Worcester, conducting his former duties as well as those of research engineer and having his office at the main works in Worcester.

The sales force of the Norton Co. which gathered last week from all over the United States and from abroad, was enthusiastic about the prospects and opportunities for the future. They report increasing business in their various territories.

Profitable Year for American Car & Foundry

Earnings of American Car & Foundry Co. for the year ended April 30, 1919, were the largest in its history according to the annual report just made public. Net earnings after taxes were \$17,273,172, compared with \$16,461,823 for the year before, or an equivalent earned on the common stock of \$32.23 a share as against \$30.60. Unfilled orders at the end of the fiscal year were \$100,000,000, compared with \$290,000,000 at the beginning of the same year. A feature of its finances was the large tax reserve of \$24,475,000, consuming 60 per cent of operating net. The federal tax item was equivalent to \$81 a share on the common stock. In the words of the report:

"The company's output has been not only large but most diversified. Besides a great variety of smaller articles of different kinds, it has produced shell, both gas and high explosive, in enormous quantities and running in size from the 3-in. to the 10-in. Practically the government's entire requirements of the 6-in. gas and 10-in. high explosive shell came from the company's plants. It produced a very great part of all the 3-in. shell called for by the navy. It alone made the specially designed railroad gun mounts for the 7-in. and 8-in. guns and the 12-in. mortars used by our armies abroad. Many thousands of the military railroad cars used for the supply of our forces in France came from its workshops. Its production of caissons, limbers, battery, escort and supply wagons and artillery vehicles of all kinds ran into the tens of thousands."

Of the 100,000 freight cars of various kinds ordered by the director-general of railroads, 31,000 were awarded to this company. The payment for these cars has caused the company officials some concern since the Congress which adjourned last March failed to provide funds. It was finally decided that the director-general should issue his certificates of indebtedness, these to be paid as soon as he has sufficient money to do so. In regard to prospects for future business the report advises:

"There already is, and undoubtedly will continue to

be, a demand for the company's products from foreign countries—both from the new nations which have come into being with the peace, and from the older countries whose activities for almost five years have been given over to the prosecution of the war. Such demand from these countries is likely to be large and insistent—larger and more insistent than can for some time to come be met by their own facilities for production. This will open up new problems of finance and of credit—but there is no reason to believe that these problems cannot be solved, or that the company will not be able to obtain its fair share of the business. During the fiscal year just closed, orders for 10,000 cars for Italy and for 3250 cars for India were booked."

West Side Foundry Co. of Troy Reorganized

The West Side Foundry Co., Troy, N. Y., has been purchased by Thomas G. Perkins, Inc., investment bankers, Hartford, Conn., and has been renamed the Troy Foundry & Machine Co. and incorporated under Massachusetts laws. The same management will be continued, with the addition of Thomas C. Perkins as treasurer. Within recent months there has been added an extensive machine department making particularly transmissions and engine-driven tire pumps for automobile companies. The company will also manufacture in the plant at Green Island cotton, hay and shavings presses. Additional capital will be provided for the extension of the company.

Through the sale of his stock in the American Zinc Products Co., Greencastle, Ind. and Fort Smith, Ark., the president, D. W. Kerr, transfers control to the Valley Iron Co., Youngstown, Ohio. Mr. Kerr has resigned as president and is succeeded by C. W. Martin, formerly vice-president Deforest Sheet & Tin Plate Co., Niles, Ohio. C. C. Stewart is the new vice-president, and C. H. Stewart the new secretary. The New York offices will be continued at 50 Church Street, with Marcus L. Filley as eastern sales manager.

MEDALS FOR ENGINEERS

Proposal of American Society of Mechanical Engineers to Signalize Achievement

The council of the American Society of Mechanical Engineers at the Detroit meeting accepted the report of Former President Ira N. Hollis as chairman of the committees on relations with colleges. This committee, acting as a special committee on awards, established a system of consistent and ample recognition of distinguished service in the mechanical engineering profession. The recommendations as offered and approved will be placed in the hands of the committee on constitution and by-laws for elaboration into a working system, and the results will be embodied in the next Year Book of the society. However, it will not be necessary to await such action should the council decide to act earlier in any case. The new system of awards follows:

1. Honorary membership voted by the Council as at present, in accordance with the constitution of the Society.
2. Life membership for the best contribution to the literature of mechanical engineering to be found in the papers for one year.
3. A medal for some notable invention or some striking improvement in connection with the industries.
4. Honorable mention for notable contribution to engineering, either of a practical nature or in literature.
5. Scholarships or fellowships for exceptional attainments in college work.
6. A medal or special mention for notable work by junior members and by students.

As a consequence of the establishment of the new system of rewards, Charles T. Main, the retiring president of the society, turned over to the council the sum of \$2,500, which represents the amount which the society gave to him to defray expenses as delegate on the reconstruction committee which went abroad recently, together with a sum which he added to bring the amount to the named figure. This money will be used as the council thinks best in this connection.

In Dr. Hollis's report he reviews the work already undertaken by the society in the matter of awards and other ways in which members profit. As to the actual nature of the proposed awards the report states:

"It is common experience that the income of all societies and institutions fluctuates from year to year and that while we are prosperous to-day changes may come to reduce our income and render us less able to carry out expensive awards. Consequently, it would be better to have the recognition in the nature of medals or awards provided by gift and bequest to the society. Some of the foreign societies have paid considerable attention to this form of benefaction. Such awards should not be expensive as it is the recognition far more than the actual intrinsic value of anything given to a member that renders it acceptable and stimulating. It would be possible occasionally to set aside a fund the income from which would be devoted to some award named in honor of a distinguished member of our society. Such action, and the gifts that might follow a well recognized system of award, would gradually accumulate the endowment funds for all such purposes.

"The desire for approval on the part of his colleagues is one of the strongest motives that can actuate any human being. It is more powerful even than the instinct of self-preservation because the individual who gains in a large measure the respect of his fellow men is stimulated to wider service, while he who has lost their respect is broken down both professionally and morally. The finest title to fame comes from the approval of one's own profession and from the fellow members of a great society. Those who have a professional knowledge of the work that we have done have the right to give us the larger encouragement to better work.

"At the present time a member finds his chief satisfaction in the work done and in the commendation of a few friends. Even so striking an illustration of excellent service as that of the boiler code committee has up to this time had no form of public encouragement from our council or our society. We have approved

the work of the committee and we have invariably assisted them in their interpretation, but notwithstanding the fact that many states have by legislative enactment recognized the value of this committee's work, we of the society have made little or no public acknowledgment. The war has undoubtedly stimulated active thought in this direction. The service of our members in the field and in the training camps has caused us to think more acutely on the whole subject of recognition for good work. Many of our members have gone into service at a financial and physical sacrifice to themselves in the hope of being able to do their full share towards bringing victory to our country. The time is ripe then for generous recognition to men who have served both in peace and in war.

"In taking up the establishment of some awards by our society certain fundamental ideas should be kept in mind. The main purpose of such recognition is to establish a cordial air of good fellowship on the part of all members of the society toward those who have done work out of the ordinary. Every member who presents a paper should know that it is going to be part of his record as an engineer and that where high merit is exhibited it will obtain speedy recognition from his colleagues. That is the only stimulus that we can give for good papers. Beside this every engineer in our society who is engaged in manufacturing should know that any marked improvement in the arts would also have quick recognition by the entire society.

"We have too great a tendency to pass over in silence the work of our colleagues, taking for granted that the work itself is a suitable reward. In that way our society loses something, perhaps a tangible something, in its relation to the whole country. At present there is a supposition on the part of Western members that it is a New York or Eastern aggregation. Nothing could be further from the truth, but nevertheless the council should take every opportunity to combat the belief that men remote from headquarters cannot get quite the same benefits and the same recognition, but it should be quick to call attention to the good work of any member, however remote from headquarters he may be."

Federal Training for Disabled Service Men

According to information just given out by the Federal Board for Vocational Training, Washington, about 5000 disabled soldiers, sailors and marines are waiting for training until their compensation is settled by the War Risk Insurance Bureau. A bill has passed the Senate and been referred to a committee of the House to do away with this delay, and allow the man to draw at once \$75 monthly with an additional sum for dependents. The board now has 21 branch offices. One soldier, who was a cable-splicer for 16 years before the war, is now taking training to become a salesman and has been promised a position with his former electric company. Another soldier, made deaf in battle, is studying lip reading and also chemistry and physics in order to enter the production department of a starch factory of which he was formerly clerk.

Arrangements have been made by the American Manufacturers' Export Association whereby introduction cards will be placed in the hands of foreign buyers about to visit this country. These cards, properly signed by representatives of the United States Government abroad, banks, chambers of commerce and the representatives of the Export Association in foreign lands, will serve to accredit visiting buyers to the New York office of the Export Association.

Two 1265-hp. watertube boilers, which are capable of being fired with either coal or gas, have been installed at the Hazelton blast furnace battery of the Republic Iron & Steel Co. Two others are being placed.

A reprint of the regulations of the Treasury Department relating to the Federal capital stock tax is being issued in booklet form by the Guaranty Trust Co. of New York, 140 Broadway.

Iron Products Corporation Finances

The Iron Products Corporation, 90 West Street, New York, recently chartered as announced in THE IRON AGE of June 26, has an authorized capital stock of \$3,000,000, par value, 8 per cent cumulative convertible preferred stock and 150,000 shares of common stock without par value. It has acquired an option upon all of the capital stock of Essex Foundry Co., Newark, N. J., and offers to the stockholders of Central Foundry Co. the following exchanges: One share first-preferred stock of Central Foundry Co. for one share of 8 per cent cumulative convertible preferred stock (par value \$100 each) of Iron Products Corporation; one share ordinary-preferred stock of Central Foundry Co. for one share of common stock of the corporation; one share of common stock of Central Foundry Co. for $\frac{1}{2}$ share of common stock of the corporation.

Chase National Bank has been appointed registrar and Mercantile Trust Co. has been appointed transfer agent of Iron Products Corporation. Dividends upon the stock of the new corporation will accrue from August 15, 1919. Upon the exchange of all of the stock of the Central Foundry Co. and the exercise of the option upon the stock of Essex Foundry, the assets and liabilities (exclusive of organization expenses) of Iron Products Corporation will be:

ASSETS	
Cash	\$1,000,000.00
Capital stock of Central Foundry Co.:	
First preferred, par value.....	472,700.00
Ordinary preferred, par value.....	1,600,000.00
Common, par value.....	3,600,000.00
Capital stock of Essex Foundry:	
Preferred, par value	204,500.00
Common, par value	1,004,900.00
LIABILITIES	
Capital Stock of Iron Products Corporation:	
Preferred, par value	\$1,677,200.00
Common, no par value, 90,000 shares.	

Andrews Steel Co. Extensions

The S. R. Smythe Co., Pittsburgh, recently completed its third contract with the Andrews Steel Co., Newport, Ky., as consulting and contracting engineer, the work comprising the excavations, foundations, construction of two 100-ton basic open-hearth furnaces, charging floor, buildings, storage bins, five Morgan mechanical gas producers, ash and coal-handling equipment, and rearrangement of all railroad and stock tracks. The new plant is now in operation. The S. R. Smythe Co. has also completed for the same company a rearrangement of the gas producer plant for blooming mill soaking pits, whereby the gas has been changed from an underground system to an overhead system. The gas is conveyed from producers over the top of the blooming mill building, with downtakes, headers and connections, and some new features are provided as to soot catchers and insulation. New soaking pit furnaces have been built after patents of H. E. Smythe, whereby the pit furnaces have no checkers for the gas, but there are checkers in the air chambers only. The result is a milder heat with less oxidation, and less gas is required, while output has been increased.

Contracts for Steel Mills Awarded

Contracts for the construction of the plant and for machinery for the Eastern Rolling Mill Co., Baltimore, recently organized and headed by J. M. Jones, have been awarded and the work started. The plant will be located in the Canton section and the first outlay, it is announced, will be about \$1,000,000 with possibly the expenditure of \$500,000 a little later for additional equipment. There will be three large buildings. The contract has been awarded to the Belmont Iron Works, Real Estate Trust Building, Philadelphia. The buildings will be of iron and steel construction. An office building also will be built.

The following contracts for equipment have been awarded: Hot mills, National Roll & Foundry Co., Avonmore, Pa.; cold mills, Hyde Park Foundry & Machine Co.; furnaces, George J. Hagan & Co., Pitts-

burgh; electrical equipment, General Electric Co., New York; eight overhead cranes, Chesapeake Iron Works, Baltimore; large driving gears and pickling equipment, Master Machine Co., Pittsburgh.

The plant will manufacture automobile bodies, hoods and fenders, metallic furniture and other articles. The company has opened offices at 503 and 504 Lexington Building, Baltimore.

Slick-Knox Steel Co. Formed

The Slick-Knox Steel Co. has been formed at Wheatland, Pa., through merger of the Sharon Steel Mfg. Co. with the Hydraulic Drawn Forging Co., Ellwood City, Pa. The Sharon Steel Mfg. Co. was organized several weeks ago at Sharon, Pa., and acquired the property of the Blaw-Knox Co. at Wheatland, which moved its equipment to Hoboken, N. J. The Slick-Knox Steel Co. is capitalized for \$6,000,000, equally divided between common and preferred, and stock will be immediately offered for sale. Directors of the new company are E. E. Slick, formerly vice-president of the Midvale Steel & Ordnance Co.; L. L. Knox, W. H. Schoery, William McIntyre, C. K. Strausbaugh and J. R. McGill. All are Sharon, Pa., men except Messrs. Slick and Knox, who live in Pittsburgh. Officers of the new company will be E. E. Slick, chairman of the board; L. L. Knox, president; C. K. Strausbaugh, vice-president in charge of operations; William McIntyre, vice-president in charge of sales; J. R. McGill, secretary and treasurer.

Marked Improvements in Demand

YOUNGSTOWN, OHIO, July 1.—The past week has seen a noticeable improvement in practically all finished iron and steel lines, the volume of inquiries growing as well as the actual placing of orders. A fair amount of the business placed is coming unsolicited. Perhaps the most noteworthy feature of the situation is the picking up in the sheet trade, with prospects that short-time deliveries will soon be a thing of the past. Advance in price varying from \$3 to \$4 a ton is promised by makers within a short time. One producer has already made a small increase for certain grades of sheets. Increases granted various sheet mill workers at the Atlantic City conference are certain to produce higher prices as a result of advanced costs of production. Sheet sales are better than in many months, say sales heads, with mill schedules reflecting the betterment to a marked degree.

Pipe and wire sales are keeping far in advance of production capacity. A substantial jobbing demand for butt-weld pipe has entered the market; until this time jobbers have been reluctant in placing orders except against immediate business. Lap-weld mills have enough business booked to keep them operating throughout the third quarter.

Reduced Production Expected

UNIONTOWN, Pa., June 30—Curtailment in the present regional production of coal and coke is forecasted for this week as a result of at least two days' lay-off expected in celebration of July 4. Furnace interests whose fuel needs are not covered for the first week of the month and local brokers are scurrying around to cover their needs, for not more than 150 cars of unconsigned coke are standing on the tracks in the entire Connellsville region. No effort is to be made to secure a full week's operation on the present scale of production, for it is realized that this would be futile, inasmuch as the workers will celebrate the Fourth in the manner they deem best. Last year they worked a full day on July 4, when the war-time needs made it essential that there should not be a single hour's lay-off in producing the fuel for war purposes. In anticipation of the conditions here, blast furnace operators have bought up all unconsigned coke available.

Contract negotiations are proceeding with considerable vigor.

SHORT TRADE ITEMS

The Ohio Electric & Controller Co., 5900 Maurice Ave., Cleveland, announces it has appointed as its representatives the following firms: The Iron & Steel Equipment Co., 1502 First National Bank Building, Pittsburgh; Williams, Beasley Co., 343 South Dearborn Street, Chicago; Linn O. Morrow, 707 Franklin Trust Building, Philadelphia; J. W. Dopp & Co., 18 Columbia Street, Detroit; Kelly, Powell Ltd., 403 McArthur Building, Winnipeg, Canada; Wonham, Bates & Goode, Inc., Dominion Express Building, Montreal, Canada; Shook & Fletcher Supply Co., Birmingham, Ala. For export business, the company will be represented by Wonham, Bates & Goode, Inc., 17 Battery Place, New York, in London, Paris, Havana, Rio de Janeiro; by Mitsui & Co., 65 Broadway, New York, in Japan, China, Philippine Islands and Honolulu, and by Gustav Neilson at Christiania, in Norway, Sweden and Denmark.

A new monthly steel stock list that is unusually complete has just been issued by the Betz-Pierce Co., Cleveland. In addition to the various lists and classifications commonly found in publications of this character, the stock lists shows standard classifications of extras on cold-drawn nickel, vanadium and special alloy steels, S. A. E. specifications for screw stock, carbon, nickel and chrome vanadium steels, classifications of extras on cold-finished steel and shafting, extras on cold and hot-rolled strip steel, and on high speed and carbon tool steels, drill rod lists, and various miscellaneous information. The soft open-hearth steel lists include weight per ft.-lb., extras, and length of bars, in addition to sizes and quantities in stock. The list is provided with a thumb index.

The Metallo Gasket Co. has recently been incorporated for the manufacture of a line of gaskets and other packings at New Brunswick, N. J. The officers are: Zeno Schultes, president and treasurer; George Geipel, vice-president, and Stanley S. Geipel, secretary. Z. Schultes was manager of the Goetze Gasket & Packing Co. for about 14 years. George Geipel has been an erecting engineer for some 35 years, specializing in refrigerating and steam power plants, and Stanley S. Geipel has had 10 years' experience in mechanical engineering. The company will concentrate for a time on its metallo corrugated copper gasket with asbestos cord inlaid in the copper grooves or corrugations.

Judgment for the defendant was given in the Federal Court at Indianapolis, in the suit by the Keystone Steel & Wire Co. of Illinois, against the Kokomo Steel & Wire Co., Kokomo, Ind. Damages of \$80,000 were claimed as a result of failure to fulfill contract by defendant, as alleged, who was to deliver 9000 to 11,000 gross tons of steel rods between May 21, 1915 and May 31, 1916, the defendant making no further deliveries after delivery of 9271 gross tons. The defendant claimed it had delivered 800 tons monthly as stipulated in the contract, making a total of more than 9000 gross tons, the minimum requirement.

The Pusey & Jones Co., Wilmington, Del., is said to have closed negotiations for the sale of its local shipbuilding plant to a new company organized by William G. Coxe, formerly president of the Harlan & Hollingsworth Corporation, Wilmington; Stewart Lee and associates. The new company is represented by Cassatt & Co., bankers, Commercial Trust Building, Philadelphia. It is said that the sale of the local plant is being made to provide funds for settlement of the financial obligations of the Pusey & Jones Co.

The corporate name of Lewis F. Shoemaker & Co., Pottstown, Pa., has been changed to the Shoemaker-Satterthwaite Bridge Co. The change is only in the title, the management and personnel remains unchanged. This company carries on a structural steel and fabrication business with plant at Pottstown, and

offices at No. 2 South Fifteenth Street, Philadelphia, and No. 256 Broadway, New York.

The Roeper Crane & Hoist Works, Reading, Pa., is working on a contract for the American International Shipbuilding Corporation, Hog Island, Pa., which comprises lifting gears for thirty-five 7000-ton "B" ships, now building for the Emergency Fleet Corporation. The gears are of 7½ tons capacity, and are used for handling the heads of steam turbines.

The Colorado Fuel & Iron Co. earned in the first quarter of 1919, after interest, taxes and preferred dividends, the equivalent of \$1.05 a share on the common, as against \$4.92 the same quarter of last year. Gross receipts were \$10,071,785, or about \$2,000,000 less than for the first quarter of 1918, while operating expenses were over \$9,000,000 in both quarter periods.

The Nilson Die & Tool Co., 319-331 West Ohio Street, Chicago, has patented a new type of turn-buckle, the holes of which are formed in stamping, making drilling unnecessary. It is asserted that this turnbuckle requires less stock in weight than other types and can be produced more cheaply, especially in the smaller sizes.

The Cockerill works are blowing in a blast furnace and an open-hearth furnace in the course of a few weeks, says a recent issue of the *London Ironmonger*. The Angleur Steel Works will resume operations in an open-hearth furnace, while the Forges de la Providence also intend to blow in a blast furnace.

The Cleveland Milling Machine Co. has opened an employees' restaurant, in which it will sell food at cost price. This restaurant was designed with the view of accommodating 300 people and has the most up-to-date kitchen facilities to prepare regular as well as short order meals.

The Youngstown Engineers' Club, Youngstown, Ohio, with a membership of about 700, embracing civil engineers, mechanical, metallurgical, and chemically trained men, has opened permanent quarters in the Park Theater Building.

District sales agents, department heads and salesmen of the Midvale Steel & Ordnance Co., held a sales conference at the general offices in Philadelphia on Thursday, June 26, and then left for Johnstown, Pa., to inspect the Cambria Steel Co. plant, remaining there over Sunday.

Numerous improvements are being made at the plant of the Cambria Steel Co., Johnstown, Pa. Worn-out equipment is being repaired. In the open-hearth plant four new cranes, are to be installed. The power plant will be enlarged, affording room for 15,000 hp. additional capacity.

Extensive improvements will be made at the No. 2 furnace of the Crane Iron Works, Catasauqua, Pa., to thoroughly modernize the plant. The furnace was recently shut down for relining; the plans include a new skip-hoist and other equipment.

The Erie City Iron Works, Erie, Pa., builder of horizontal and vertical water tube boilers, horizontal tubular stationary boilers, tanks and steel plate work, is erecting an addition to its plant 40 x 122 ft.

The W. E. Caldwell Co., Louisville, Ky., tank manufacturer, associated with J. B. Crawford, an experienced saw mill man, will build a 30,000 to 35,000 cut band saw mill in St. Landry Parish, where it owns large tracts of cypress, ash, oak and gum timber.

To avoid confusion with other firms of similar name, the Art Metal Mfg. Co., 217-223 West Huron Street, Chicago, will hereafter be known as the Fiat Metal Mfg. Co.

The Pittsburgh Seamless Tube Co., Pittsburgh, works at Economy, Pa., has filed notice of an increase in its capital stock from \$500,000 to \$5,000,000.

The name of the Schleif Iron & Steel Corporation, New York, has been changed to Goodger, Delacour & Co., Inc.

Machinery Markets and News of the Works

PRICES UNDER DISCUSSION

Some Tool Builders Predict Advances

Rising Labor Costs Given Consideration—Business Continues Fair in Central West

There is considerable discussion as to the probability of higher prices for machine tools in the next few months. Some builders have received notice of advanced prices for castings due to the demands of iron molders for increased wages and a shorter work day, while machine-shop workers in many localities are also striving for a 44-hr. week with a decrease in pay.

Favorable reports regarding activity in machine tools continue to come from the Central West, but the Eastern markets are quiet. Business in general during the first half of the year was fairly satisfactory, but improvement is looked for, there being a belief that the signing of the peace treaty will release many projects which have been held up for months.

In Chicago the aggregate business in June was larger than in May, and the increase is generally attributed to the steady expansion among miscellaneous industries. Good-sized orders are emanating from the oil districts of the Southwest. The Studebaker Corpo-

ration, South Bend, Ind., is expected to place orders for production tools soon, having recently bought tool-room equipment. Another automobile concern which will increase its capacity greatly in the Nordyke & Marmon Co., Indianapolis. Other buyers in the Chicago district are the Midwest Engine Co., Indianapolis; the Chicago Pneumatic Tool Co., which has placed orders for its new plant at Franklin, Pa., and the Beneke & Kropf Mfg. Co., Chicago.

The Marion Steam Shovel Co., Marion, Ohio, has inquired in Cleveland for about a dozen tools.

Cincinnati machine-tool builders report having received fairly good orders from the Scandinavian countries.

The largest buying in many weeks in the Philadelphia district was completed recently by the Wright Roller Bearing Co., Philadelphia, which bought 32 grinders and other tools. The Lycoming Foundry & Machine Co., Williamsport, Pa., making automobile motors, has bought a few tools. The Bureau of Aircraft Production is calling for bids on about 15 metal-working and 25 woodworking machines. A list recently issued by the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., calling for bids on 24 tools for its new boiler plant at Richmond, Va., has not been acted upon.

New York

NEW YORK, July 1.

Taking the country as a whole, the machine-tool business of the first half of the year has been fairly satisfactory. A few companies are fully as busy as during the war period. Most of this activity can be traced directly to the expansion of automotive industries. The demand for internal grinders has also been exceptionally good, and one leading maker of these machines is much busier than he was at times during the war. Unfortunately, these are the exceptions, there being many companies engaged in manufacturing tools which are not as fully engaged as they were in normal times before the war. One reason for this is the greatly increased tool-making capacity of the country, nearly all manufacturers having enlarged their plants or added to their facilities during the period of war demand. One large company in the Central West, which does not trace all of its business to the activity of the automobile industry, states that it is now working at about two-thirds of its war-time basis.

At the gathering of machine-tool manufacturers and their sales representatives at Atlantic City from June 18 to 25 on the occasion of the convention of railroad master mechanics and car-builders, there was a deal of optimism that conditions during the latter half of the year will show a distinct improvement over the first half. The question of prices was informally discussed, and it appeared to be the conviction of many that some prices will advance within the next few months. Increasing labor costs are pointed to as the principal reason for such advances. Some machine-tool manufacturers have already received notices from foundries of higher prices for castings, due to the demands of iron molders for higher wages and a shorter work day, while machine-shop workers are also striving for a shorter day, the 44 hr. week being demanded in several manufacturing districts without reduction in pay.

No improvement in business in the New York market is to be noted. There is an absence of large inquiries, but a moderate demand exists for small lots of tools. A decided improvement seemed to be imminent a few weeks ago, but for reasons not generally accounted for, such expected buying has not been done. The competition of second-hand tools is unquestionably a growing factor in the limiting of sales of new tools. Nearly all prospective buyers are looking for good, second-hand tools before making any purchases.

Edward Maurer & Co., 80 Maiden Lane, New York, will engage in selling American machinery in the Ukraine district of Russia. In seeking connections with manufacturers to represent them in Russia, this firm states that it will have warehouses at Odessa and Fastov, a show room at Kiev and selling branches at a score or more Russian cities and towns. All purchases will be financed through the exchange of Russian products, and Maurer & Co. will arrange to ship these products to the United States.

The Kearney & Trecker Co., Milwaukee, manufacturer of milling machines, which has for many years been represented in the New York market by Hill, Clarke & Co., will soon open a New York office and sell direct. B. W. Stone, for 19 years with the E. W. Bliss Co., Brooklyn, has been appointed New York district sales manager. His address until arrangements are completed for an office will be 2224 East Forty-seventh Street, Brooklyn.

The Alpha Electric Co., Inc., 116 West Twenty-ninth Street, New York, has leased property at 151-55 West Thirtieth Street, aggregating about 22,500 sq. ft., for a new establishment.

Contracts have been let by George H. Thacher & Co., Albany, N. Y., manufacturer of castings, grate bars, etc., for their new machine shop to the William G. Sheehan Construction Co., 30 Dewitt Street, Albany, at a cost of about \$16,000. The company is also having plans prepared for a new cupola on Leonard Street, to cost \$15,000.

The International Arms & Fuze Co., Grove Street, Bloomfield, N. J., is planning for the sale of its munition plant and property, comprising about 26 acres of land, with four main one-story buildings and adjoining structures, including power plant. The works has a total floor area of about 550,000 sq. ft.

The Union Lamp Co., Union Hill, N. J., has been incorporated with a capital stock of \$50,000 by Joseph Hudson, Jr., Charles Levy and Isaac Covino, to manufacture lamps, electric fixtures, etc.

The Drop Forging Co. of New York, 301 Westside Avenue, Jersey City, N. J., has arranged for the immediate construction of an addition for a hammer shop.

The D. D. Mills Co., Jersey City, N. J., has been incorporated with a capital stock of \$18,000 by Augustine Davis and William G. McCune, New York, and William Lester, Plainfield, N. J., to manufacture iron and steel castings.

The Bona Heating System Co., West Hoboken, N. J., has been incorporated with a capital stock of \$250,000 by A. Andt and Silvio Motta, to manufacture heating apparatus. The registered office is at 114 Summit Avenue.

The American Locomotive Co., 30 Church Street, New York, has concluded negotiations with the Barbour Flax Spinning Co., Paterson, N. J., for the purchase of a portion of its local Rogers locomotive works by the latter company. The acquisition includes the buildings along the Raceway, and provides for water rights. The Dolphin Jute Mills, a local organization, has also secured part of the property at Spruce and Oliver streets.

The Gummed Tape Machine Co., Newark, N. J., has been incorporated with a capital stock of \$25,000 by Charles G. Mortimer, Clyde D. Souter and Robert E. Torrance, to manufacture special machinery.

The Ironbound Radiator Repair Co., 149 Oliver Street, Newark, N. J., has filed notice of organization. Louis Falcone heads the company.

The H. E. Rainaud Co., 135 Jackson Street, Newark, N. J., manufacturer of electric reading lamps, is planning for the removal of its works to Meriden, Conn., where it will occupy the former plant of the J. D. Bergen Co., manufacturer of cut glass. H. E. Rainaud heads the company.

The A. W. Wheaton Brass Works, 157 New Jersey Railroad Avenue, Newark, N. J., has filed plans for the erection of a two-story addition to cost about \$5,500.

The Hay Foundry & Iron Works, Plum Point Lane, Newark, N. J., has filed plans for a three-story brick and steel addition to cost \$47,000.

The Victor Nailing Machine Co., Brooklyn, has been incorporated with a capital of \$55,000 by W. W. Miller, E. G. Lane and E. Stutzer, 13 Windsor Place, to manufacture machinery.

The Ocean Transportation Corporation, 25 Beaver Street, New York, has leased the block of property from West Street to the East River, between India and Huron streets, Greenpoint, Long Island, as a site for a large marine terminal. Extensive improvements will be made, including the construction of sheds and warehouses, with the installation of handling, conveying and other machinery for operations.

The H. T. T. Garage, Inc., 52 Vanderbilt Avenue, New York, has filed plans for a one-story brick machine automobile service building, 100 x 100 ft., on the Harlem River Terrace, near Fordham Road, to cost \$22,000.

The Pinson Iron Works, Inc., Brooklyn, has been incorporated with a capital of \$10,000 by J. and A. Pinson, and M. Levine, 357 Amboy Street, Brooklyn, to manufacture iron and steel.

The Naval Senate Committee, Washington, has added an appropriation of \$200,000 to the Naval bill, for the construction of a new plant building at the Brooklyn Navy Yard. The Bureau of Yards and Docks, Navy Department, Washington, will be in charge.

The Stratton Equipment Co., New York, has been incorporated with a capital stock of \$25,000 by J. R. Carman, J. C. and C. J. Stratton, 276 Riverside Avenue, to manufacture mechanical equipment, airplane apparatus, etc.

Certain property of H. R. Heinicke, Inc., 147 Fourth Avenue, New York, manufacturer of chimneys and stacks for power plant use, will be sold by Francis P. Garvan, Alien Property Custodian.

The Empire Metal Aircraft Corporation, New York, has been incorporated with a capital stock of \$50,000 by W. M. G. Watson, J. H. Claffy and H. A. St. George, 41 Park Row, to manufacture metal airplane equipment and parts.

The American & British Mfg. Corporation, New York, has been incorporated with a capital stock of \$3,260,000 by D. T. Connett, W. J. Cullen and C. M. McKeever, 120 Broadway, to manufacture airplanes, motor cars and general ordnance.

The Universal Metal Parts Mfg. Co., New York, has been incorporated with a capital of \$10,000 by G. Meyer, J. Mumaw and S. A. Lichenstein, 608 West 188th Street, to manufacture automobile and truck parts.

The Lauraine Magneto Co., 1765 Broadway, New York, is building a three-story plant, 100 x 150 ft., on Thirteenth Street, near Van Alst Avenue, Long Island City, at a cost of about \$125,000.

The Un-X-Ld Products Corporation, New York, has been incorporated with a capital of \$10,000 by A. J. Concotta, N. Fishman and R. M. Schnuer, 51 Chambers Street, to manufacture automobile signal devices.

The Tungsten Tool Co., New York, has been incorporated with a capital stock of \$50,000 by G. Posner, A. and J. Simons, 2139 Daly Avenue, Bronx, to manufacture tools, machine parts, etc.

The Interstate Mechanical Laboratories, Inc., New York, has been incorporated with a capital stock of \$75,000 by H. A. Stoddard, Pelham, N. Y., and R. P. Kennard, 17 West Fifty-sixth Street, New York, to manufacture machine tools and machinery.

The G. R. Weinberg & Al. Posner Engineering Co., 120 Broadway, New York, has increased its capital stock from \$25,000 to \$175,000.

The L. E. Waterman Co., 191 Broadway, New York, is having plans prepared by Architects Helmle & Corbett, 190 Montague Street, Brooklyn, for its proposed new fountain-pen manufacturing plant at Newark, N. J., on Peddie Street near Hillside Avenue. It will be six stories, 260 x 275 ft.

The Capitol Shade Roller Co., New York, has been incorporated with a capital stock of \$100,000 by J. M. Sheen, J. J. Collins and W. V. Saxe, 56 West Eightieth Street, to manufacture shade rollers and other specialties.

The Anchor Bolt & Nut Co., Poughkeepsie, N. Y., has filed notice of dissolution.

Albert T. Hoagland, 116 St. Mark's Avenue, Brooklyn, operating a machine works for automobile repairs, etc., has filed plans for a one-story shop, 25 x 100 ft., at Underhill Avenue, near Dean Street, to cost \$10,000.

The Riverside Package Machinery Co., New York, has been incorporated with a capital stock of \$50,000 by M. Galibert, J. D. Reifsnnyder and E. Hirschberg, 434 East 157th Street, to manufacture machinery, foundry equipment, etc.

The David E. Allen-Yonkers Foundry, Inc., Yonkers, N. Y., has been incorporated with a capital stock of \$25,000 by W. S. Pronk, H. Whitehead and E. E. Allen, to manufacture castings, etc.

I. Levy, 714 Metropolitan Avenue, Brooklyn, operating a brass works, has filed plans for extensions in his three-story plant to cost about \$12,000.

Julius Blum & Co., 510-12 West Twenty-fourth Street, New York, dealers in iron and steel products, have leased a five-story building, 100 x 125 ft., at 532-40 West Twenty-second Street, for a new establishment. They plan extensive improvements, and an electric traveling crane, labor-saving equipment, etc., will be installed.

Brewster & Co., 671 Fifth Avenue, New York, manufacturer of automobiles, with plant at the Bridge Plaza, Long Island City, have increased their capital stock from \$2,250,000 to \$3,000,000.

The corporate style of Grinberg Brothers, manufacturers of stoves and ranges, etc., 154 South Street, New York, has been changed to Grinnell Brothers, Inc. Additional capital has been subscribed, and the new organization is incorporated for \$150,000, with no liabilities.

The Natsch Gear Works, recently incorporated with a capital stock of \$6,000, has established a plant at 451 Hudson Avenue, Brooklyn, N. Y., where it will do a gear-cutting business. William Natsch, president and general manager, was formerly connected with the gear cutting department of the Himoff Machine Co., Astoria, N. Y. New York offices has been established at 126 Liberty Street.

Philadelphia

PHILADELPHIA, July 1.

The largest buying in this market in several weeks has been done by the Wright Roller Bearing Co., Philadelphia, which purchased 32 grinding machines, several lathes and other new tools and some second-hand equipment. This company is busy on automobile bearings. Some of the other activity in the market is due to the expansion of the automotive industry. The Lycoming Foundry & Machine Co., Williamsport, Pa., which makes motors for Dort automobiles, has bought a few tools to increase its output, and the Light Mfg. & Foundry Co., Pottstown, Pa., also doing automobile work, is inquiring for new equipment. The American Die & Tool Co., East Reading, Pa., which manufactures transmission gears, has also come into the market for a small list of tools.

The John Wood Mfg. Co., Conshohocken, Pa., has purchased a building at Toronto, Ont., which will be equipped at once for the manufacture of tanks, boilers, etc. The company will buy part of its equipment in Philadelphia and the remainder in Toronto. Its requirements include plate-working machines, pipe machines, motors, etc.

No action has yet been taken by the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., on its recent list calling for 24 machines for a new boiler plant under construction at Richmond, Va.

The Bureau of Aircraft Production is calling for bids on about 15 machine tools and 25 wood-working machines for the manufacture of airplanes.

The L. M. Helfner Mfg. Co., a new company with capital stock of \$1,500,000, has acquired a building at Chester, Pa., which will be equipped for the manufacture of automobiles

and farm tractors. L. M. Heifner, president of the new company, is also general manager of the Smith-Davis Machinery Co., Market and Twenty-first Streets, Philadelphia.

The Eastern Foundry & Machine Co., Ambler, Pa., has purchased the plant of the Herr Automatic Press Co., also at Ambler. Thomas Ruth is president of the former company, which will specialize in bronze castings.

The Joseph H. Brenner Co., Hagerstown, Md., has installed an electric tilting furnace, manufactured by the Universal Engineering Corporation, Fidelity Building, Baltimore, and will engage in the refining of non-ferrous metals.

The Philadelphia Sash Weight Works, Glenwood Avenue and Twenty-second Street, Philadelphia, has filed plans for a one-story foundry, 70 x 146 ft., at Tulip and Roxborough streets, to cost \$16,000.

The Merchant & Evans Co., 2035 Washington Street, Philadelphia, manufacturer of tin plate, metals, etc., has acquired a factory building on property 125 x 200 ft., at Washington Avenue and Twenty-first Street, from E. W. Dwight, for about \$50,000, including equipment. The structure will be used by the new owner in connection with its regular production.

Alexander Wolfington's Son, 8 North Twentieth Street, Philadelphia, manufacturer of automobile bodies and parts, has filed plans for a four-story brick addition, 12 x 26 ft., to cost \$6,000.

The new aircraft assembly shop to be constructed at the League Island Navy Yard, Philadelphia, by the Bureau of Yards and Docks, will be one-story, 201 x 680 ft., with wing extension 347 x 403 ft. With equipment it is estimated to cost \$500,000. Bids are being taken by the bureau for two scrap storage buildings, Nos. 4 and 10.

The Universal Chain Co., Stroudsburg, Pa., has had plans prepared for a one-story addition, 72 x 100 ft., to cost \$15,000.

An electric power plant will be constructed in connection with the additions to be made by the LeRoy Hotel Co., Inc., Chestnut Avenue, Altoona, Pa., at its local establishment.

The Pennsylvania Railroad has resumed operations at its car repair shops at Newport, Pa., effective June 23. The plant has been shut down for a few months past.

The Public Service Commission, Harrisburg, Pa., has granted permission to the following companies to issue securities for improvements, etc.: Pennsylvania Utilities Co., Easton, \$74,000; Titusville Light & Power Co., Titusville, \$15,000; and the Coatesville Trolley Co., Coatesville, \$100,000.

The Camden Auto Radiator Co., Camden, N. J., will make extensions and improvements in its machine shop to cost about \$7,100.

The Marion Heating Co., Camden, N. J., has been incorporated with a capital stock of \$125,000 by David Baird, Jr., F. A. Starr and M. W. Applegate, to manufacture heating equipment.

A merger of cement companies in the Lehigh Valley district of Pennsylvania, for export operations, has been effected under the name of the Cement Export Co., organized under Delaware laws. The companies include the Coplay Cement Co., Coplay; Dexter Portland Cement Co., Nazareth; the Nazareth Cement Co., Nazareth; Phoenix Cement Co., Nazareth; Allentown Portland Cement Co., Allentown; Lawrence Portland Cement Co., Northampton; Giant Portland Cement Co., Philadelphia; Hercules Cement Co., New York; and the Helderberg Cement Co.

Buffalo

BUFFALO, June 30.

The Optimo Disc Wheel Corporation, recently incorporated at Buffalo with a capitalization of \$250,000, has purchased two acres at Hertel and Elmwood avenues, with Erie Railroad switch connections, where it will erect a machine shop and assembling building, 60 x 140 ft., for the manufacture of automobile wheels, demountable rims, etc. The present office of the company is at 470 Ellicott Square Building. J. F. Spencer, H. A. Sellers and C. M. Beatty are directors.

The Rogers-Brown Iron Co., Erie County Bank Building, Buffalo, is taking bids for a machine shop and storage building, 66 x 262 ft., at its plant, Hamburg Turnpike, Union Canal and the South Buffalo Railroad.

The Lisk Mfg. Co., 160 Fifth Avenue, New York, is having plans drawn by S. Firestone, architect, Granite Building, Rochester, for a five-story factory building to be erected at Canandaigua, N. Y.

The King Shipping Case Corporation, Syracuse, N. Y., has been incorporated with a capital stock of \$750,000 to manufacture steel shipping cases. F. C. King, A. N. Ellis, L. S. Chapman and W. H. Foxhall are the directors.

The Syracuse Auto Supply Co., Syracuse, N. Y., has been incorporated by H. W. Smith, L. W. Bennett and C. H. Sanford with a capitalization of \$60,000 to manufacture automobile specialties.

The Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., manufacturer of heating equipment, has increased its capital stock from \$2,350,000 to \$4,000,000. It recently took over the plant and business of the Ames Iron Works, Oswego, N. Y., manufacturer of boilers, engines, etc.

The American Can Co., 120 Broadway, New York, is planning for the resumption of normal operations at its plant at Geneva, N. Y., used for munition work and shut down following the war. It is said that machinery and equipment for can manufacture will be installed at an early date, with employment of about 100 persons for initial operations, to be increased to about 400 people.

The Norwich Wire Works, Norwich, N. Y., is having plans prepared for a one-story addition, 66 x 92 ft., to cost \$25,000, including equipment.

The M. M. Tractor Corporation, Buffalo, has been incorporated in Delaware with capital stock of \$2,500,000 by Charles A. Mickle, Buffalo; George A. Metcalf and Harold Hargrove, Detroit, Mich., to manufacture automobile tractors, parts, etc.

The Cary Safe Co., 250 Chicago Street, Buffalo, manufacturer of safes, vaults, etc., has increased its capital stock from \$100,000 to \$200,000.

The additions under way at the plant of the J. P. Devine Co., 1372 Clinton Street, Buffalo, manufacturer of vacuum drying apparatus, etc., will cost about \$200,000. Its foundry on Goundry Street will be augmented by a new foundry, 90 x 225 ft. A one-story building, 90 x 100 ft., will be erected and equipped as a general assembly plant, while a vacuum pump works, 30 x 100 ft., will also be constructed. The Charles Borrick & Sons Co. has the building contract.

The Auto Motive Tractor Co. of America, Buffalo, has been incorporated with a capital stock of \$4,000,000 by J. O. Moore, H. L. Jauch and F. J. Maloney, local incorporators, to manufacture automobile tractors, parts, etc. The company will operate a plant in Maryland and does not plan any Buffalo works at the present time. It is proposed to establish a local office.

The Rochester Auto & Tool Co., Rochester, N. Y., has been incorporated with a capital stock of \$25,000 by C. Wassill and F. Rzepecki to manufacture tools, auto parts, etc.

The reclamation plant of the Victoria Metal Co., Eighth Street and the Pennsylvania Railroad, Erie, Pa., operating a foundry and machine shop, was entirely destroyed by fire June 18. Plans are under way for rebuilding it along broader lines, and equipment for both the reclaiming and refining of copper-bearing material and white metals will be shortly purchased.

The Porter-Cable Machine Co., Syracuse, N. Y., manufacturer of lathes, milling attachments, etc., recently increased its capital stock of \$150,000 to \$425,000 to provide for the purchase of the Mulliner-Enlund Tool Co. of Syracuse, manufacturer of toolroom lathes, and also for the purpose of increasing its equipment for the manufacture of its own lines.

Baltimore

BALTIMORE, June 30.

The Efficiency Engineering Co., 406 Vickers Building, Baltimore, has been incorporated with \$100,000 capital stock by J. Royall, R. Edgar Tippet and Maurice W. Zetlin, to do a general manufacturing business in machinery, etc.

William Haselhurst, head of the City Spring Works, Park Avenue and Preston Street, Baltimore, has been granted a permit for the construction of a two-story blacksmith shop, 100x150 feet, to be used in connection with the manufacture of automobile springs, etc. It will cost \$18,000.

Receivers have been appointed for the Baltimore Roofing & Asbestos Co., 500 South Hanover Street, Baltimore, manufacturer of asbestos paper, mill board and roofing. The petition was filed by officials of the company. The company has a plant at Asbestos, Md.

The Virgin's Military Institute, Lexington, Va., will install two 500-hp. boilers to cost about \$15,000.

The Blue Ridge Mill Co., Roaring River, N. C., will rebuild its plant, recently destroyed by fire. Prices are wanted on foundry equipment. C. H. Greenwood is manager.

The plant of the Morrow Machine Co., Chester, S. C., recently destroyed by fire, will be rebuilt.

John T. Burris & Son, Anderson, S. C., plan to build a plant for the manufacture of metal shingles.

Emil Funk, York Road, Baltimore, has commenced the erection of a two-story machine shop and automobile repair

works, 50x80 ft., on York Road, near Park Avenue, to cost \$10,000.

C. L. Probst and associates, Lynchburg, Va., are planning the establishment of an iron foundry.

The Southern Electric Steel Co., Scott Building, Lynchburg, Va., is considering the construction of a one-story foundry, 90x120 ft., to cost in excess of \$50,000, including equipment. J. N. Keyser is president.

The Charleston Dry Dock & Machine Co., Charleston, S. C., has been incorporated with a capital stock of \$2,225,000 under Delaware laws to manufacture marine equipment and machinery, repair vessels, etc. The incorporators are Harold J. Gallagher, Mount Vernon, N. Y.; Winthrop H. Kellogg, Port Washington, N. Y., and Robert M. Reid, New York.

Chicago

CHICAGO, June 30.

Despite the fact that individual orders were small, the aggregate business done in the month of June was considerably larger than that of May—in fact, twice as large, according to some estimates. Although automobile and motor accessory manufacturers continue prominent as buyers, the increase in the total volume of business is attributed to a steady expansion in activity among a great variety of manufacturers. Dealers whose territories include the oil district of the Southwest state that generous orders are emanating from that territory. The Studebaker Corporation, South Bend, Ind., which purchased considerable tool room equipment several weeks ago, is expected to place orders for production tools in the near future. It is understood that no list will be issued, but purchases will be made from time to time throughout the summer.

The Midwest Engine Co., Indianapolis, Ind., has bought four turret lathes and is inquiring for a number of automatic screw machines and multiple spindle drilling machines. The Chicago Pneumatic Tool Co. has placed part of the equipment for its new Franklin, Pa., plant at Pittsburgh. The Beneke & Kropf Mfg. Co., manufacturer of plumbers' supplies, 2559 West Twenty-first Street, Chicago, has purchased five hand screw machines and is in the market for other tools. The A. Leschen & Sons Rope Co., St. Louis, is in the market for a number of tools, including engine and turret lathes. The Pennsylvania Railroad has ordered one turret lathe for its Logansport, Ind., shops. The Smith Typewriter Co., Chicago, which recently inquired for a milling machine, two drill presses, a 14-in. engine lathe and a surface grinding machine, has purchased second hand equipment. The Federal Stamping Co., Holland, Mich., is in the market for a 26-in. short bed lathe, 30-in. short bed planer, 36-in. power squaring shear, universal milling machine and a power press.

The Federal Machinery Sales Co., Chicago, has secured the exclusive agency for the Smith & Mills shapers and the Minster heavy duty drills, in the Chicago and Milwaukee districts.

Edward D. Shank, architect, 1130 First National Bank Building, Chicago, will receive bids this week on a plant to be erected at Hammond, Ind., for the Railway Motor Co. of America. It will comprise a two story main structure, 100 x 250 ft.; a power house, 40 x 75 ft.; a two story building, 100 x 200 ft., and a one story unit, 100 x 150 ft.

The Stutz Motor Co. has awarded contracts for the erection of a three-story salesroom and shop, 49 x 178 ft., at 2442-2444 South Michigan Boulevard, Chicago. The estimated cost is \$50,000.

The International Harvester Co. has let contracts for the construction of a combination four-story plant and two and three story warehouse, 77 x 226 ft., at 601 West Thirty-first Street, Chicago. The approximate cost is \$80,000.

The Standard Spring Co. has awarded contracts for the construction of a one-story plant, 70 x 100 ft., at 232 to 236 East Ontario Street, Chicago, to cost \$8,000.

The American Steel Spring Co., Chicago, is making interior alterations to its plant at 865 Sangamon Street, to cost \$6,000.

The Steel Cushion Wheel Co., Chicago, has been incorporated with a capital stock of \$5,000. The organizers include Norton N. Files, 1417 Berwyn Avenue, Chicago, and Willard L. Pollard, Evanston.

* The Moline Pressed Steel Co., Moline, Ill., has increased its capital stock from \$100,000 to \$500,000.

The Steel Combination Lock Co., Waukegan, Ill., has increased its capital stock from \$40,000 to \$100,000.

The B. & D. Mfg. Co., Rock Island, Ill., has been incorporated with a capital stock of \$15,000 to manufacture metal tools, dies, etc. D. H. Donaldson is president.

The Woodstock Typewriter Co., Woodstock, Ill., plans to construct an addition, 36 x 64 ft., to be used for its polishing, drilling and milling departments.

The Chicago Hardware Foundry Co., North Chicago, Ill., will increase its capital stock from \$400,000 to \$500,000, and plans the erection of a foundry and warehouse to cost \$100,000.

The New York Blower Co., manufacturer of blowers, ventilators and mail boxes, has moved into the old quarters of the American Three-Way Prism Co., La Porte, Ind., and has commenced operations. An additional plant, 100 x 200 ft., will be constructed in the near future adjacent to the present factory.

The Logansport Radiator Equipment Co., Logansport, Ind., is preparing to construct an addition, 100 x 270 ft., chiefly for foundry purposes, to cost about \$25,000.

The Perfecting Machine Co., Michigan City, Ind., has rented temporary quarters at 127 West Fourth Street, but is preparing to erect a new structure to house its foundry and machine shop.

The O. K. Giant Battery Co. has started the construction of a plant at Gary, Ind., the first unit of which will be 100 x 200 ft.

The Rapid Rim Co., Huntington, Ind., is building a plant for the manufacture of automobile rims. The estimated cost is \$75,000.

The Perfection Tire & Rubber Co., Fort Madison, Iowa, is constructing an addition, 100 x 220 ft., three stories. It will be completed about Aug. 1.

The Bolte Tractor Works, Davenport, Iowa, was recently incorporated with a capital stock of \$500,000 by Joseph C. Bolte, Maude Bolte and A. D. Ballou, all of that city.

The Waterloo Construction Machinery Co., Waterloo, Iowa, is constructing an addition, 61 x 166 ft., at an estimated cost of \$20,000.

A. E. Anderson, Princeton, Ill., is having plans prepared for the construction of a new one-story machine shop, 40 x 50 ft. An automobile service works, 80 x 110 ft., will be erected later in conjunction with the shop.

The Isko Co., 111 West Washington Street, Chicago, manufacturer of ice and refrigerating machinery, has increased its capital from \$3,000,000 to \$4,125,000. It recently leased a portion of the plant of the Northwestern Terra Cotta Co., Terra Cotta Place and Clybourne Avenue, for increased capacity.

Murray Nelson, Chicago, has taken out a permit to build a new one-story machine shop at Eastman and Dayton streets to cost about \$35,000.

The Bemidji Iron Works, Bemidji, Minn., is said to be planning for the rebuilding of the section of its works recently destroyed by fire with a loss of about \$10,000.

The Pacific Flush Tank Co., Ravenswood Avenue, Chicago, manufacturer of siphons, pumping apparatus, etc., has broken ground for a one-story and basement addition, 35 x 125 ft., to cost about \$20,000.

The Chicago Roller Skate Co., 224 North Ada Street, Chicago, manufacturer of bolts, etc., is having plans drawn for the construction of a new one-story machine shop, 100 x 300 ft., at West Lake Avenue and Forty-second Street, to cost about \$75,000, including equipment.

New England

Boston, June 30.

The New England manufacturers of malleable castings are experiencing a sharp revival in business. They report the demand to be general. The hardware trade is better than it was, and these manufacturers use large quantities of malleable castings, and the product is in greater demand from builders of many kinds of machinery.

J. E. Snyder & Son, Worcester, Mass., manufacturers of drilling machines, are establishing agencies in various European countries. The company states that its foreign business is good and improving rapidly. One order of twenty 25-in. and 30-in. drilling machines was recently shipped to France, and other shipments have been made to Denmark, Norway, Sweden and Japan.

Various reports are heard of a proposed consolidation of the textile machinery industry of New England, but so far as can be learned there is but little truth to them. One report has it that the Crompton & Knowles Loom Works, Worcester, Mass., the Draper Co., Hopedale, and the Whitin Machine Co., Whitinsville, are to merge their interests, but officials of the companies make denial. Another rumor involves the Saco-Lowell Co., which is the consolidation of the

Saco-Petee Co. and the Lowell Machine Works, with plants in Lowell and Newton Upper Falls, Mass., and Biddeford, Me. Similar rumors have flown about in other years, but excepting for the Saco-Lowell combination have never materialized. The four companies named do by far the lion's share of the textile machinery business of the country, employing altogether more than 12,000 men.

The E. W. Bemis Machine Co., Worcester, Mass., manufacturer of the Bemis collet lathe chuck, is establishing a shop at 8 Bradley Building, where it will produce the chuck and other tools. Up to the present time the company has had its work done by other parties.

The Worcester Machine Screw Co., Worcester, Mass., a division of the Standard Screw Co., has increased its capacity by the addition of small automatic screw machines and finishing machines of corresponding sizes. The company reports a steady improvement in business, the month of June being the best thus far of the year. This seems to be the general experience in the machine screw industry of New England.

The Hopedale Mfg. Co., Hopedale, Mass., manufacturer of automatic cotton looms, of which Clare H. Draper is the proprietor, is building a four-story addition, 60 x 360 ft.

The Rochester Handle Co., Rochester, N. H., is planning for the rebuilding of its plant, destroyed by fire June 5, with loss estimated at \$50,000.

The Trieschmann Mfg. Co., Hartford, Conn., has been incorporated with a capital of \$50,000 by L. H. Treischmann, John C. Nyser and Peter Christensen to manufacture metal products and devices.

The Hart & Cooley Co., New Britain, Conn., operating a local plant for the manufacture of heating registers, ventilators, etc., has filed articles of incorporation with a capital of \$1,000,000. The directors are H. S. Hart, N. P. Cooley, E. C. Goodwin, J. H. Robinson, G. P. Hart and E. H. Cooper.

The Fafnir Bearing Co., New Britain, Conn., manufacturer of ball bearings, will build a new four-story plant, 50 x 95 ft. and 16 x 22 ft., on Orange Street, to cost about \$50,000. The company has increased its capital from \$50,000 to \$1,000,000.

The Davis Foundry Co., Lawrence, Mass., has awarded a contract to L. E. Locke, Bay State Building, for the construction of a new one-story foundry, 100 x 200 ft., to cost about \$50,000, including equipment.

The Bridgeport Rolling Mills, Inc., Stratford, Conn., has increased its capital from \$150,000 to \$300,000.

The Standard Iron Works Co., New Haven, Conn., has been incorporated with a capital of \$10,000 by Louis Sachs and S. D. Pardoll to manufacture iron products, structural steel, etc.

The Pawtucket Screw Co., Inc., Hughes Avenue, Pawtucket, R. I., will build a one-story addition, 36 x 120 ft., to cost about \$20,000.

The C. K. Tool Co., New Haven, Conn., has filed notice of change of name to the Roberts Mfg. Co.

The new plant of the Seamless Rubber Co., New Haven, Conn., to be located on Hallock Avenue, will consist of three main buildings, each five stories, 60 x 240 ft., connected by two one-story structures; a power plant will also be constructed. It is said that the new works with equipment will cost close to \$1,000,000. The Aberthaw Construction Co. and the Hope Construction Co., Boston, are the contractors.

The Bureau of Yards and Docks, Washington, has taken bids for the construction of a new two-story, steel structural shop, 100 x 366 ft., at the Navy Yard, Boston.

The Baker Mfg. Co., 242 North Water Street, New Bedford, Mass., manufacturer of printing machinery, will build a one-story addition, 55 x 110 ft., to cost about \$20,000.

The Taylor & Fenn Co., Hartford, Conn., manufacturer of castings, etc., has increased its capital from \$250,000 to \$500,000.

The M. Gordon & Sons Corporation, Norwich, Conn., is planning for the construction of a new one-story works, 32 x 112 ft., in the Central Wharf section, to cost about \$20,000. It will be equipped for the manufacture of metal specialties.

Contractors are figuring on a manufacturing plant at Portland, Me., for the American Can Co., New York. The estimated cost is \$300,000.

Work has been started on a \$35,000 two-story addition, 40 x 177 ft., to the machine shop of the Donnelly Machine Co., Brockton, Mass.

A contract has been placed by the New Haven Malleable Iron Co., New Haven, Conn., for a one-story addition, 72 x 134 ft., to its plant. The cost will be \$13,000.

The Continental Wood Screw Co., New Bedford, Mass., has plans ready for a two-story brick factory addition, 52 x 76 ft., to cost about \$16,000.

Cleveland

CLEVELAND, June 30.

The demand for machinery continues good, the volume of business being about the same in the past few weeks. There is considerable new inquiry for small lots up to half a dozen machines, largely from automobile and accessory manufacturers. A large amount of factory construction work is coming out in new plants and extensions, which will necessitate the purchase of additional machinery. The largest inquiry the past week was from the Marion Steam Shovel Co., Marion, Ohio, for about a dozen machines, including lathes, radial drills, milling and grinding machines. A good volume of scattered orders is still coming from Akron tire and tire mold manufacturers. One dealer sold four boring mills the past week, two going to the rubber industry. The Firestone Steel Products Co., which recently issued a list of 17 machines, has not yet bought its required equipment. Planing machines are in good demand and deliveries by some manufacturers are becoming further advanced. The demand for punching and shearing machinery is somewhat more active, orders being mostly for single machines. The call for second-hand machinery is very brisk.

The Cuyahoga Spring Co., Waterloo Road, Cleveland, will erect a new plant, 80 x 150 ft., on Berea Road, two stories and of the mill type construction. The contract has been placed with the Austin Co., Cleveland.

The General Electric Co. has placed a contract with the Sam W. Emerson Co., Cleveland, for a four-story factory, 112 x 300 ft., of brick, steel and mill type construction, for the manufacture of incandescent lamps.

The Ohio Electric & Controller Co., Cleveland, has placed a contract for the erection of a two-story plant, 80 x 100 ft.

The Metals Welding Co., Cleveland, which for some time has been operated as a subsidiary of the Steel Products Co., Cleveland, has been reorganized as a separate company with a capital stock of \$200,000 and will hereafter operate independently. Officers have not yet been elected, but it is stated that the present management will not be changed.

The Grabler Mfg. Co., Cleveland, has placed contract for the erection of an addition that will contain about 75,000 sq. ft. of floor space.

The Steel Products Co., Cleveland, which recently acquired the plant of the Parker Rustproof Co., Detroit, will enlarge the building, increasing its facilities for the production of drag links, starting cranks and rod assemblies. The company will take possession of the new plant Sept. 15. It will continue to operate its Hart Avenue plant in Detroit.

The Fairmount Tool & Forging Co., Cleveland, will enlarge its plant, and will purchase drop forging and other equipment for manufacturing automobile tool kits.

The Gabriel Mfg. Co., Cleveland, is planning the erection of a two-story addition, 40 x 151 ft.

The Foster Mfg. Co., 2113 East Seventy-ninth Street, Cleveland, has placed a contract for the erection of a one-story plant, 51 x 80 ft.

The Timken Roller Bearing Co., Canton, Ohio, announces that it will shortly begin the erection of a new plant in Columbus for the manufacture of roller bearings.

The Defiance Machine Works, Defiance, Ohio, is planning the erection of a two story and basement machine shop, 120 x 161 ft., in addition to building a new foundry, for which a contract has been placed.

The Cascade Tire & Rubber Co., Ravenna, Ohio, has been incorporated with a capital stock of \$1,000,000 and contemplates the erection of a plant for the manufacture of tires.

The London-Orville Co., Columbus, Ohio, has increased its capital stock from \$1,000,000 to \$1,250,000 for the purpose of acquiring the plant of the Ideal Steel Barrel Vault Co., Chicago Heights, Ill.

Cincinnati

CINCINNATI, June 30.

Domestic inquiry for machine tools is holding up fairly well, and business is coming in at a satisfactory rate. No large orders have been placed lately, but the buying of single tools by automobile manufacturers and others is sufficiently large to keep nearly all plants busy. Export business is also encouraging, and recently some good sized orders have been received from the Scandinavian countries. Contrary to expectations, the second-hand machinery business is rather slow. The number of used machine tools for sale is surprisingly low, and this also applies to other kinds of machinery.

The disposal of machine tools held by the Government is not causing as much anxiety as formerly. It is generally understood that the Ordnance Salvage Department will not

accept any bids on new machines under 70 per cent of cost. A fixed minimum schedule for used machines is also in effect. Latest reports from Washington are to the effect that the remaining surplus of machine tools may be distributed among the trade schools of the country. This suggestion, if carried out, will meet with the approval of all machine-tool builders.

Boiler and tank manufacturers report an increase in activities. All jobbing foundries have sufficient work to keep them operating at full capacity.

The Simmons Co., Kenosha, Wis., bed manufacturer, has leased a factory building on Beckman Street, Cincinnati, and will install equipment at an early date.

The Trailmobile Co., Cincinnati, whose new plant is under construction in Oakley, has decided to double the size of the main building. The proposed structure will be 200 x 150 ft.

The Herchede Hall Clock Co., Cincinnati, has had plans prepared for an addition to its plant on McMillan Street that will double its present capacity.

The Ohio Refining Co., whose headquarters are at Louisville, Ky., will erect an oil refining plant on Paddock Road, Cincinnati.

The Alhambra Tile Co., Newport, Ky., will rebuild its plant which was destroyed by fire June 24, entailing a loss of over \$25,000.

The A. C. Electrical Mfg. Co., Dayton, Ohio, has been incorporated with \$100,000 capital stock by R. H. Croninger and others.

The Central Engineering Co., Dayton, has been incorporated with \$25,000 capital stock by James K. Davis and others.

The Dayton Forging & Heat Treating Co., Dayton, is a new incorporation with \$50,000 capital stock. William H. Hewitt is one of the principal incorporators.

The Zenith Motor Truck Co., Dayton, is fitting up a plant at 36 North Canal Street for the manufacture of motor trucks. O. F. Schmidt is president of the company.

The James Leffel Co., Springfield, Ohio, has let contract to the Concrete Steel Co. for its proposed plant. The main building will be 83 x 1000 ft.; the foundry 110 x 160 ft., and pattern shop 60 x 140 ft., all one story.

The Eagle Engineering Co., Springfield, Ohio, has tentative plans under way for an addition to its plant. F. A. Pfeifer is general manager. The company makes a specialty of jigs and dies.

The Knox Tire & Rubber Co., Mount Vernon, Ohio, has let contract for a manufacturing plant. B. E. France is one of the principal officers.

The Beemiller Foundry & Machine Co., Bellville, Ohio, has been incorporated with \$100,000 capital stock by James P. Wood and others.

The Cincinnati Ball Crank Co., Cincinnati, has completed arrangements with C. H. Clark, New York City, whereby it will make the Clark compression coupling, patents pending, under the name of the Cincinnati compression coupling.

The Perfect Sleeve Ironer Mfg. Co., Louisville, has been incorporated in Delaware with a capital of \$30,000 by A. A. Myers, C. H. Boynes and O. D. Duffin, to manufacture sad-irons.

The Standard Milk Machinery Co., Louisville, manufacturer of dairy machinery, has increased its capital to \$20,000.

The Efficiency Mileage Recorder Co., Louisville, has been incorporated with a capital stock of \$50,000 to manufacture mileage recorders for railroads. J. D. Augustus, C. P. Nathan and J. A. Stewart are the principles.

The Weighing Machine Mfg. Co., Louisville, has been incorporated by Ben F. Vogt, R. J. Zanone and others with a capital stock of \$5,000 to manufacture weighing machines.

Pittsburgh

PITTSBURGH, June 30.

The Hagan Foundry Corporation, Pittsburgh, has awarded contract to the A. A. Lane Co., Euclid Avenue, Cleveland, Ohio, for the erection of a two-story foundry at Orrville, Ohio, to cost about \$50,000. It will be divided into a main foundry, corerom and charging department. Howard G. Hammer, 407 Murtland Avenue, Pittsburgh, is treasurer.

The Transcontinental Oil Co., Pittsburgh, is now being organized under Delaware laws to take over the Tex-Penn Oil Co., the Pittsburgh-Texas Oil & Gas Co. of West Virginia, the Riverside Eastern Oil Co. of Delaware, and the Riverside Western Oil Co. of West Virginia. The new company plans for an addition to an existing refinery in the

Texas district, increasing the capacity from 3000 to 10,000 bbl. per day. A series of gasoline plants will also be constructed in the Duke-Knowles oil fields. M. L. Benedum will be chairman of the board of directors of the new company.

The Kanaelk Coal Co., Clendenin, W. Va., is planning a new power plant at its properties. W. W. Whyte is president.

A three-story machine works and automobile service plant, 45 x 160 ft., to cost about \$40,000, will be erected by the Summers-Buick Co., Huntington, W. Va. J. M. Summers is president.

The Elkins Garage Co., Elkins, W. Va., recently incorporated with a capital of \$75,000, is planning for a two-story machine works and automobile service plant, 90 x 150 ft. J. R. Kemper is treasurer and manager.

The Consolidation Coal Co., Fairmont, W. Va., will make improvements in its coal tippie, which was damaged by the fire June 22.

Milwaukee

MILWAUKEE, June 30.

The machine-tool business is undergoing steady expansion and growth. Probably the most encouraging factor is the broadening of the scope of demand and its sources. While the bulk of orders in the last three or four months has come from the automotive industries, a resumption of buying by other divisions of the metal-working trade is noted, and the distribution appears to be reaching the proportions of normal times.

The Motor Castings Co., Milwaukee, which will build a new foundry in West Allis, is perfecting its organization as a Wisconsin corporation with an authorized capital stock of \$100,000. The principals are Arthur C. Swallow, a Milwaukee capitalist; John S. Wilson, 84 Michigan Street; and Gustave Anderson, Manitowoc, Wis. Mr. Anderson formerly was works manager of the Wisconsin Aluminum Foundry Co., Manitowoc, and will become general superintendent of the new foundry. The company expects to start pouring by Sept. 1. and plans an initial output of 300 tons per month.

The Pawling & Harnischfeger Co., Milwaukee, manufacturer of electric cranes, will build a forge shop addition costing about \$45,000, occupying part of a site of seven and one-half acres recently acquired. Plans are being completed by Kirchoff & Rose, architects, Majestic Building, and work will begin at once. The report that the Pawling & Harnischfeger Co. intends to build a steel foundry is stated to be an error.

The joint building committee of the Madison, Wis., Board of Education and Board of Industrial Education has adopted plans prepared by Fred L. Kronenberg, local architect, for the proposed new \$300,000 vocational training institute, to be erected during the summer and fall. Bids for the construction work will be asked early in July. Machinery and equipment will be purchased later.

The Topp-Stewart Tractor Co., Clintonville, Wis., is contemplating the erection of an addition to be used as a heat treating room and forge shop. The estimated cost of the improvement is \$30,000.

The Great Lakes Malleable Iron Co., Milwaukee, has filed articles of incorporation to manufacture malleable castings, etc. The capital stock is \$100,000, and the incorporators are F. J. Vea, C. M. Osterheld and Chris O. Egeland. Mr. Vea is president of the Stoughton Wagon Co., Stoughton, Wis. No further information concerning the project is available at this time.

The Board of Education, Two Rivers, Wis., has engaged John D. Chubb, architect, Chicago, to prepare plans for a \$125,000 addition to the high school, to be constructed during the summer. Manual training facilities will be provided. William T. Darling is superintendent of schools.

The George Diamond Economy Process, Milwaukee, manufacturer of machines for making paper boxes, has increased its capital stock from \$200,000 to \$2,500,000 to finance the construction of a new plant costing about \$750,000, at De Pere, Wis. The works are being designed by L. A. DeGuere, consulting engineer, Grand Rapids, Wis., and include a 60-ton paper mill, a two-story machine shop, 64 x 200 ft., a boiler house, 50 x 75 ft., three-story finishing room, 107 x 107 ft., and a two-story warehouse, 60 x 150 ft. The Diamond company has been conducting a shop in Milwaukee for several years. It now plans to specialize in building self-contained machines. George Diamond is vice-president and general manager.

The Board of Education, Oconomowoc, Wis., has engaged Parkinson & Dockendorf, architects, LaCrosse, Wis., to design a new high school building, with vocational training to be erected during the summer and fall. Bids for the construction, the cost not to exceed \$150,000. H. Kirk White is secretary of the board.

The Sanitary Refrigerating Machine Co., 345 Jackson

Street, Milwaukee, has increased its capital stock from \$50,000 to \$100,000. It is enlarging its manufacturing space and installing some new equipment.

The Menasha Boiler Works, Menasha, Wis., awarded the general contract for designing and constructing the first unit of its new plant, 90 x 110 ft., to L. A. DeGuere, consulting engineer, Grand Rapids, Wis. The company recently was incorporated with \$100,000 capital stock, to manufacture steam boilers, tanks and other equipment, specializing in paper and pulp-mill requirements.

The Lotex Tire Co., Fond du Lac, Wis., will award contracts this week for the erection of the first unit of its new plant, 45 x 200 ft., with a separate boiler house and power plant, 80 x 80 ft. The buildings, without machinery and equipment, will cost about \$45,000. B. E. Mehner is architect.

The Vim Tractor Co., Schleisingsville, Wis., which recently took over the plant and business of the Standard Machinery Co., maker of gas engines, is contemplating the erection of a new machine shop and assembling floor costing \$35,000. Charles Storck is president.

E. J. Duescher, Seattle, Wash., is negotiating for the purchase of the Webster Mfg. Co.'s factory at Appleton, Wis., with the intention of converting it for the manufacture of oil burners and air compressors for domestic heating systems. The Business Men's Association of Kewaunee, Wis., has guaranteed to provide a site and building.

The Fox River Tractor Co., Appleton, Wis., has awarded contracts for the erection of the first unit of its new plant, 60 x 200 ft., one story of brick and steel. It is to be ready Aug. 25. The general contractors are Greinke Bros. The concern recently was incorporated with a capital stock of \$200,000. Frank Saiberlich is president and general manager.

John F. Weber, West Allis, Wis., operating a machine shop and garage at 684-688 Seventy-third Avenue, has incorporated the business as the J. F. Weber Co., with an authorized capital stock of \$40,000. A shop addition will be built.

The Briggs & Stratton Co., 1047 Louis Avenue, Milwaukee, will award contracts this week, through Herman J. Esser, architect, 402 Camp Building, for a five-story addition, 60 x 170 ft., connected by a wing, 21 x 70 ft., to the present shop of equal size. A new office building also will be built. With equipment, the improvement will cost \$300,000 or more.

The Loomis-Weinke Motor Co., Portage, Wis., will build a one-story brick and tile addition, 90 x 100 ft., costing \$20,000.

The Multitone Mfg. Co., Eau Claire, Wis., has acquired the three-story factory, 50 x 150 ft., of the Eau Claire Trunk Co., and will convert it into a phonograph and musical instrument plant. E. J. Sailstad is general manager.

Indianapolis

INDIANAPOLIS, June 28, 1919.

Overflow business coming from automobile repair shops and the smaller manufacturers is fair to good. The demand for milling machinery continues. The volume of inquiries received indicates a continuance of activity in both heavy and light machinery. June business has shown an increase over the preceding months of the year.

Articles of incorporation of the Auburn Automobile Co., Auburn, Ind., capital stock \$1,750,000, have been filed. It is stated that the new incorporation follows a reorganization of the company with additional outside capital. Morris Eckhart, president of the old company, retains that office in the new corporation. J. I. Farley, Wilson H. Dennison, Emanuel A. Johnson, A. M. Graffis, V. B. Walling, James H. Rose and Mr. Eckhart are directors of the new company. Several new buildings are to be erected to care for the increased production which is the plan of the new organization.

The International Electric Co., Indianapolis, has increased its capital stock from \$50,000 to \$75,000.

The American Metal Products Co. has changed its headquarters from Indianapolis to Danville, Ind.

The Kaws Tractor Mfg. Co., Indianapolis, has been incorporated with \$75,000 capital stock, to manufacture tractors. The directors are Henry Sevarin, Joseph F. Ankenbrock and Julius Karrmann.

The Roussey-Centlivre Rubber Co., Fort Wayne, Ind., has been incorporated with \$100,000 capital stock to manufacture automobile tires and tubes. The directors are A. J. Roussey, Carl and Charles Centlivre.

The H. P. Johnson Mfg. Co., Indianapolis, has been incorporated to manufacture rail joints. The directors are Hans P. Johnson, Christ Sorenson and C. W. Johnson.

The Nurdyke & Marmon Co., Indianapolis, has let con-

tracts for two new factory buildings, one five stories, 80 x 600 ft., the other 100 x 800 ft., one story. The plans also include a new planing mill, dry kiln and power plant and when completed the works will cover 45 acres. The additions will be used for the manufacture of automobile bodies and as an assembling department. The company plans to double its capacity for the manufacture of automobiles and flour milling machinery.

The Johnson Acetylene Gas Co., Crawfordsville, Ind., has increased its capital stock from \$25,000 to \$100,000.

The Iowa Pump Co., Indianapolis, has been incorporated with \$50,000 capital stock to manufacture pumps. The directors are Paul D. Farley, Melvin C. Clipp and K. D. Foster.

The Hohmann Sewing Machine Co., Franklin, Ind., has been incorporated with \$600,000 capital stock to manufacture sewing machines. The directors are Richard K. Hohmann, Ernst W. Theobald and Fred Braun, Jr.

St. Louis

ST. LOUIS, June 30.

The Dublin Gln Co., Dublin, Miss., B. W. Nichols and others interested, is reported in the market for about \$20,000 worth of ginning equipment.

The Farmers' Gln Co., Jackson, Miss., Fred Lynch, Jr., C. B. Whittington and others interested, is in the market for about \$15,000 worth of machinery.

A power plant to cost \$280,000, and a mechanically equipped coaling wharf to cost \$100,000, will be installed at New Orleans, La., by the Navy Department at Washington.

The Charity Hospital at New Orleans, La., will equip an electric power plant to cost about \$90,000. A. Wyndham Lewin is engineer in charge.

Westminster College, Fulton, Mo., will equip an electric power and heating plant to cost about \$30,000.

The Bowman Realty & Bonding Co., Third National Bank Building, St. Louis, will erect a foundry of undetermined capacity.

The Oklahoma Radiator Co., Tulsa, Okla., capital stock \$250,000, T. H. Brown, D. E. Worley and others interested, will equip a plant for the manufacture of radiators.

The Island Refining Corporation, New Orleans, George A. Burrell, president, will erect an oil refinery to cost about \$3,000,000, and to have a daily capacity of 10,000 bbl. Richmond Levering & Co., Inc., New York City, are the engineers.

The Beggs Power & Ice Co., Beggs, Okla., will equip a \$100,000 ice and cold storage plant.

The National Metal Die Mold Co., St. Louis, capital \$50,000, has been organized by Ottmar G. Stark, 1627 Locust Street, to establish a metal-working plant.

The United States Compression Inner Tube Co., Tulsa, Okla., M. C. Hale president, will erect a two-story factory, 80 x 250 ft., installing milling machines, vulcanizers and other machinery.

The city of Columbus, Miss., is in the market for \$7,000 worth of electric pumping equipment.

Detroit

DETROIT, June 30.

The Leitelt Iron Works, replacing the Adolph Leitelt Iron Works, Grand Rapids, Mich., has been organized with a capital stock of \$250,000. Directors include D. C. McKay, Fred H. Meyer, Fred J. Zylman, Glenn W. Sackett and Charles B. Kelsey, all of Grand Rapids. D. C. McKay is president.

The Wagemaker Co., Grand Rapids, Mich., manufacturer of filing cabinets, etc., is having plans drawn for the erection of a three-story addition to its plant, 60 x 100 ft., to cost about \$75,000. Isaac Wagemaker is president.

The Schwarze Electric Co., Adrian, Mich., is having plans prepared for the erection of a one-story addition to its electrical goods manufacturing plant, 100 x 100 ft., to cost about \$20,000.

The Self-Fed Carburetor Co., Ann Arbor, Mich., has been incorporated in Delaware with a capital of \$500,000 by Ward Simpson, Charles Grant, Stanley A. Bush and George Langford, to manufacture carburetors.

The Brown Hutchinson Iron Works, Clay Avenue, Detroit, will soon commence the erection of a one-story plant, 110 x 155 ft., to cost about \$20,000. W. H. Steger is president.

The Paige Detroit Motor Car Co., McKinsty Street, Detroit, is installing new machinery and equipment in its enlarged plant, which will soon be placed in operation, allowing about 15 acres of floor space in excess of the former buildings. It is proposed to double the output. Special attention is being given to the machine and metal-working shops for the installation of labor-saving devices. Harry M. Jewett is president.

Texas

AUSTIN, June 28.

R. L. More of Vernon, and associates, have purchased a site at that place upon which they will construct a refinery with a daily capacity of 500 bbl.

The Standard Tractor Co., Dallas, will soon begin the construction of the first unit of its tractor assembling plant. It will be of steel, 60 x 200 ft., and when finished will have a capacity of 1000 tractors per year. The company plans later to manufacture a power cultivator.

According to Z. E. Marvin, Dallas, president Southern Fiber & Paper Co. of that city, plans have been practically finished for the erection of a factory for the manufacture of paper from cotton stalks, linters and other native fibers. The proposed plant will cost \$200,000.

The Empire Oil & Gas Co., Bartlesville, Okla., will install electric equipment for drilling oil wells in the Texas fields. It is stated that about 700 motors will be purchased.

The Public Service Corporation, Tulsa, Okla., has purchased a site of 60 acres adjoining that city upon which it will construct an electric power station. The power will be distributed to points within a radius of 50 miles.

The Mutual Machine & Tool Co., Gorman, Tex., has been incorporated with a capital of \$32,000 by James McCamney and Charles J. Chulow to manufacture tools and machinery.

The new plant of the Guiberson Oil Well Specialty Co., Dallas, Tex., recently organized with a capital of \$1,000,000, is estimated to cost \$50,000, and will consist of one-story main building, with machine shop, forge shop and foundry. S. A. Guiberson, Jr., 299 Broadway, New York, and N. G. Guiberson, Houston, Tex., head the company.

The El Paso Sash & Door Co., El Paso, Tex., has increased its capital from \$100,000 to \$200,000.

The foundry and machine works of the Duff-McNey Co., Temple, Tex., have been acquired by John C. Armbruster and Hugh C. Hodge, Dallas, and James M. Forsythe, McKinney, Tex. The new owners are planning to enlarge the plant and increase the capacity.

The Southwestern Tractor & Implement Co., Corpus Christi, Tex., has been incorporated with a capital of \$30,000 by W. R. Muir, J. C. Blacknail and associates, to manufacture farm implements and tractors.

The Oil City Compress Co., Corsicana, Tex., is planning for extensions and improvements in its plant, including the installation of additional machinery. The work is estimated to cost \$25,000.

The Pacific Northwest

SEATTLE, June 24.

The shipbuilding industry in this section is becoming more confused and uncertain, and gradual slowing down in the larger yards is noted.

Lumber-mill stocks are almost depleted, and the condition of manufacturing properties necessitates such extensive repairs during July and August that greatly restricted production is certain. The situation is said to be without precedent, mill owners the past week being forced to an intensified policy of selective order acceptance. Notwithstanding the heavy volume of business offered the industry is not entirely prosperous, as manufacturing costs are becoming prohibitive.

The Western States Carbonic Machinery Co., Vancouver, Wash., will establish a plant for the manufacture of iceless refrigerators. It has taken over the wood-working machinery and stock of the Interstate Pattern Works, and will build a new structure 100 x 150 ft., and add new equipment.

The Roach Timber Co., Roseburg, Ore., owner of 55,000 acres of timber in that vicinity, plans the construction of two sawmills in the Sutherlin Valley and the building of 20 miles of railroad. The work was interrupted by the war, and is to be resumed at once.

The Mountain States Power Co., Marshfield, Ore., plans repairs and improvements to the Smith mill, which it controls. The main mill has a daily capacity of 400,000 ft. Some new equipment will be installed.

The St. Helens Dock & Terminal Co., St. Helens, Ore., has been incorporated with a capital stock of \$200,000, with Charles R. McCormick, San Francisco, president. It plans the construction of one and one-half miles of railroad and a 2500-ft. loading dock equipped with loading machinery. A locomotive traveling crane will also be installed.

The Alsea Lumber Co., Eugene, Ore., will construct a new sawmill at Glenbrook with a daily capacity of 150,000 ft. A logging railroad will also be built.

The plant of the New York Brass & Iron Works, Spokane,

Wash., was damaged to the extent of \$10,000 by a recent fire. Repairs will be made immediately.

The American Aircraft Corporation, Seattle, plans the construction in Port Angeles, Wash., of a factory for the production of moderate-priced airplanes. Construction of the plant will start within 60 days. M. D. Baldwin is president.

Canada

TORONTO, June 28.

It is definitely announced that the Republic Motor Truck Co., Alma, Mich., will locate its branch factory at London, Ont. The Canadian company is capitalized at \$2,000,000, and has purchased 10 acres in East London, on which its plant will be erected. To take care of orders on hand it will commence operations in buildings in East London which have been leased for temporary quarters.

The Syracuse Sander Mfg. Co., Syracuse, N. Y., will establish a plant at Brockville, Ont., under the name of the Canada Sander Mfg. Co. Work will be started immediately.

The Pressed Metals Co. of Canada, Ltd., Toronto, will shortly commence the erection of an American branch plant at Port Huron, Mich.

The Spruce Rock Falls Pulp & Paper Co. will start work July 15 on the erection of its mill at Kitigan, Ont. The expenditure will amount to \$5,000,000.

Plans are being prepared for the erection of a factory addition for the Kindel Bed Co., 552 Ontario Street, Stratford, Ont., to cost \$100,000. James Russell, Downie Street, is the architect.

The American Auto Trimming Co., Detroit, Mich., plans the erection of a factory at Walkerville, Ont., to cost about \$100,000. F. H. Joyce is general manager.

The Gananoque Spring & Axle Co. has let the general contract to A. F. Byers & Co., 340 University Avenue, Montreal, for the erection of a factory at Oshawa, Ont. Work will be started immediately.

The Champion Spark Plug Co. of Canada, Ltd., 14 Sandwich Street, Windsor, Ont., has let the general contract to the John V. Gray Construction Co., Toronto, for the erection of a plant to cost \$60,000.

Plans are being prepared, and bids will be called shortly, for the erection of an addition for the Brantford Computing Scale Co., Ltd., 14 Grey Street, Brantford, Ont. F. C. Bodley, 108 West Street, is the architect.

Surveys of the Sumas Lake reclamation project in British Columbia have been completed and construction plans are in course of preparation. The scheme involves the erection of a pumping station equipped with 18 large pumps and an auxiliary station with two smaller pumps. The work is to be divided into three units, with a separate contract for each unit. Other contracts for concrete dams, pump houses, machinery, etc., will be awarded.

Plans have been prepared for the erection of an addition to cost about \$40,000 for Scarfe & Co., 31 Greenwich Street, Brantford, Ont. F. C. Bodley, 108 West Street, is the architect.

Ames-Holden-McCready, Ltd., 1221 Mt. Royal Avenue, Montreal, will build a rubber factory at Kitchener, Ont., to cost \$1,000,000. T. H. Rieder is interested.

The W. Cane & Sons, Ltd., Newmarket, Ont., will make repairs to their factory, which was recently damaged by fire with a loss of over \$40,000. New equipment will be required.

The Robert Redford Co., Ltd., Montreal, has been incorporated with a capital stock of \$1,000,000 by Aubrey H. Elder, Felix W. Hackett, D. Burley-Smith and others to build and repair boats, machinery, boilers, engines, etc.

The Ker & Goodwin Machinery Co., Ltd., Brantford, Ont., has been incorporated with a capital stock of \$500,000 by Abraham Goodwin, Willoughby S. Brewster, George D. Heyd and others to take over the business and plant now carried on under the style of the Ker & Goodwin Machine Co., to manufacture machinery, supplies, tools, etc.

The Booth-Coulter Coppersmithing Co., Ltd., Montreal, has been incorporated with a capital stock of \$100,000 by Gerald A. Coughlin, Francis G. Bush, George R. Drennan and others to carry on a general foundry and machine shop business.

C. E. Johansson, Inc., has been granted a license to do business in Ontario with a capital stock of \$24,000 and to manufacture measuring tools, instruments, mechanical devices, machinery, etc. Melville J. Horsey, Toronto, is the representative of the company.

The lumber mill owned by Gillies Brothers, Ltd., at Braeside, near Arnprior, Ont., was totally destroyed by fire June 24, with a loss of \$150,000. The electric plant in the mill supplied power to the town, and this was also destroyed. It is expected that the company will rebuild immediately.

Current Metal Prices

On Small Lots, from Merchants' Stocks, New York City

The quotations given below are for small lots, as sold from stores in New York City by merchants carrying stocks.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipment in carload lots from mills, these prices are given for their convenience.

Iron and Soft Steel Bars and Shapes

Per lb.

Bars:	
Refined iron, base price	3.37c
Burden's H. B. & S. bar iron, base price.....	6.10c
Burden's best bar iron, base price.....	6.30c
Swedish bars, base price.....	20.00c
Soft Steel:	
¾ to 1½ in., round and square.....	3.37c
1 to 6 in. x ¾ to 1 in.....	3.37c
1 to 6 in. x ¼ and 5/16.....	3.47c
Rods—¾ and 1 1/16.....	3.42c
Bands—1½ to 6 x 3/16 to No. 8.....	4.07c
Shapes:	
Beams and chan-rls—3 to 15 in.....	3.47c
Angles:	
3 in. x ¼ in. and larger.....	3.47c
3 in. x 3/16 and ½ in.....	3.72c
1½ to 2½ in. x ¾ in.....	3.52c
1½ x 2½ in. x 3/16 in. and thicker.....	3.47c
1 to 1¼ in. x 3/16 in.....	3.52c
1 to 1¼ in. x ½ in.....	3.57c
¾ x ¾ x ½ in.....	3.62c
¾ x ½ in.....	3.67c
¾ x ½ in.....	4.47c
½ x 3/32 in.....	5.17c
Tees:	
1 x ½ in.....	3.87c
1¼ in. x 1¼ x 3/16 in.....	3.77c
1½ to 2½ x ¼ in.....	3.57c
1½ to 2½ x 3/16 in.....	3.57c
3 in. and larger.....	3.52c

Merchant Steel

Per lb.

Tire, 1½ x ½ in. and larger.....	3.37c
Toe calk, ½ x ¾ in. and larger.....	4.00c
Open-hearth spring steel.....	6.00c
Standard cast steel, base price.....	14.00c
Extra cast steel.....	18.00 to 20.00c
Special cast steel.....	23.00 to 25.00c

Tank Plates—Steel

Per lb.

¾ in. and heavier.....	3.67c
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Sheets

Blue Annealed

Per lb.

No. 8 and 3/16 in.....	4.52c
No. 10	4.57c
No. 12	4.62c
No. 14	4.67c
No. 16	4.77c

Box Annealed—Black

Soft Steel Wood's
C. R., One Pass, Refined,
per lb. per lb.

Nos. 18 to 20	5.17c	
Nos. 22 and 24.....	5.22c	6.55c
No. 26	5.27c	6.60c
No. 28	5.37c	6.75c
No. 30	5.57c	
No. 28, 36 in. wide, 10c higher.		
Wood's Keystone Hammered,		
18-24 gage, 9¼c; 26-28 gage, 10¼c.		

Galvanized

Per lb.

No. 14.....	5.60c
No. 16.....	5.75c
Nos. 18 and 20.....	5.90c
Nos. 22 and 24.....	6.05c
No. 26	6.20c
No. 27	6.35c
No. 28	6.50c
No. 30	7.00c
No. 28, 36 in. wide, 20c. higher.	

Corrugated Roofing, Galvanized

2½ in. corrugations, 10c. per 100 lb. over flat sheets.

On a number of articles the base price only is given it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general headings of "Iron and Steel Markets" and "Metal Markets."

Steel Wire

BASE PRICE* ON NO. 9 GAGE AND COARSER

Per lb.

Bright basic	5.25c
Annealed soft	5.25c
Galvanized annealed	6.00c
Coppered basic	6.00c
Tinned soft bessemer	7.25c

*Regular extras for lighter gages.

Brass Sheet, Rod, Tube and Wire

BASE PRICE

High Brass Sheet	23c	to 24¼c
High Brass Wire	23c	to 24¼c
Brass Rod	21½c	to 23c
Brass Tube	33¼c	to 38c

Copper Sheets

Sheet copper, hot rolled, 16 oz., 27½c. to 30c. per lb. base.
Cold rolled, 14 oz. and heavier, 1c. per lb. advance over hot rolled.

Tin Plates

Coke—14x20

Bright Tin		Grade		Primes		Wasters	
Grade	Charcoal	Grade	Charcoal	80 lb.	90 lb.	80 lb.	90 lb.
"AAA"	14x20	"A"	14x20	\$8.30	\$8.40	\$8.05	\$8.15
IC .. \$11.30		IX .. 13.50		IC .. 8.80		IX .. 10.00	
IX .. 13.50		IXX .. 15.25		IX .. 10.00		IXX .. 10.95	
IXX .. 15.25		IXXX .. 17.00		IXX .. 10.95		IXXX .. 11.90	
IXXX .. 17.00		IXXXX .. 18.75		IXXX .. 11.90		IXXXX .. 12.85	
IXXXX .. 18.75				IXXXX .. 12.85			

Terne Plates

8-Lb. Coating 14x20

100 lb.	\$8.50
IC	8.65
IX	9.65
Fire door stock	11.50

Tin

Straits pig	74c to 75c
Bar	80c to 85c
American pig, 99 per cent.....	70c to 72c

Copper

Lake Ingot	18c to 19c
Electrolytic	17½c to 18½c
Casting	17c to 18c

Spelter and Sheet Zinc

Western spelter	8½c to 9c
Sheet zinc, No. 9 base, casks.....	12c; open 13c

Lead and Solder*

American pig lead.....	6c to 6¼c
Bar lead	7½c to 8¼c
Solder ½ & ½ guaranteed.....	45c
No. 1 solder	40c
Refined solder.....	34c

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal

Best grade, per lb.....	90c
Commercial grade, per lb.....	50c

Antimony

Asiatic	9¼c
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Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb. 37c to 39c

Old Metals

The market is firm. Dealers' buying prices are nominally as follows:

	Cents
Per lb.	
Copper, heavy and crucible.....	16.00
Copper, heavy and wire.....	15.00
Copper, light and bottoms.....	13.00
Brass, heavy	9.50
Brass, light	7.75
Heavy machine composition.....	15.50
No. 1 yellow rod brass turnings.....	8.50
No. 1 red brass or composition turnings.....	12.25
Lead, heavy	4.62½
Lead, tea	3.75
Zinc	4.25

are
ents
er lb.
6.00
5.00
3.00
9.50
7.75
15.50
8.50
12.25
62½
3.75
4.25